United States Department of Agriculture

Forest Service

Pacific Southwest Region

R5-MB-258B

Record of Decision

Whisky Ridge Ecological Restoration Project

Sierra National Forest Madera County, California

View of Whisky Project Looking West from Shuteye Ridge (2012)

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Printed on recycled paper – May, 2013

Record of Decision

Whisky Ridge Ecological Restoration Project

Sierra National Forest
Madera County, California

Lead Agency: USDA Forest Service

Cooperating Agencies: Not Applicable

Responsible Official: Dean A. Gould, Forest Supervisor
1600 Tollhouse Road, Clovis, California 93611

For Information Contact: Aimee Smith, Project Lead/Rangeland Management Specialist
57003 Road 225, North Fork California 93643
(559) 877-2218, extension 3151

Abstract: This document records a decision based on the Sierra National Forest Whisky Ridge Ecological Restoration Project Final Environmental Impact Statement (FEIS). Information on the alternatives considered, justification for the chosen alternative, and details regarding the decision and future implementation are discussed.

The FEIS analyzes three alternatives in detail, including no action (alternative 1), the proposed action (Alternative 2) and a third alternative (alternative 3) that was developed in response to comments received during scoping. Alternative 2 and 3 would treat 8,263 acres and actions include a variety of mechanical and hand-thinning treatments and the use of prescribed fire. Other restoration actions common to both action alternatives include in-stream channel stabilization, livestock water developments (to improve livestock distribution), noxious weed treatments, unauthorized OHV route restoration, road maintenance and reconstruction, the construction of temporary roads to access project activities, and campground facility improvements that includes new toilets and hazardous tree removal. The key difference between Alternative 2 and 3 is the size of trees that would be cut and treatment objectives. Alternative 3 limits mechanical and hand thinning treatments to 10 inch diameter at breast height (dbh) and its' emphasis is to meet fuels and fire objectives.

The purpose of the proposal is to promote and maintain ecosystem resilience, sustainability, and health through the restoration of key ecological processes while protecting communities in the wildland urban interface/intermix (WUI) from wildfire. There is a need to restore and maintain forest conditions in the project area to more closely resemble pre-1900s stand structures in order to increase resiliency and resistance to expected changes in climate and disturbance regimes. There is a need for restoration actions to have multiple resource and social benefits that include improved forest structure and health, increased quality and quantity of wildlife habitat, improved soil, water and riparian habitat function, and enhanced protection of communities and culturally significant gathering areas and sites.

Introduction

General Location

The project area consists of Federal public lands managed by the Sierra National Forest (Sierra NF). The project is located within the Wildland Urban Interface (WUI) and situated adjacent to residential areas. Communities surrounding the Whisky Ridge Project include North Fork and Bass Lake to the west, Kinsman Flat and Hogue Ranch/Clearwater area to the east, Cascadel Woods subdivision to the southwest and Central Camp to the north. The project area is approximately 18,285 acres in size and located in the Willow Creek Watershed. Vegetation types include ponderosa pine plantations, ponderosa pine, mixed conifer, true fir, and hardwood species, as well as areas dominated by brush/shrubs, herbs and grasses (meadows), rock, and steep slopes. Figure 1 on the following page displays the general location of the project in relation to the city of Fresno, California and the State of California.

Purpose and Need

The purpose and need of this project is to promote and maintain ecosystem resilience, sustainability, and health under current, changing and uncertain future environmental conditions (such as those driven by climate change and increasing human use) through the restoration of key ecological processes (e.g., returning fire to the landscape, restoring watershed function), biodiversity, wildlife habitat, and structural heterogeneity.

The impacts of early 1900s railroad logging and other harvest activities on these federal as well as formerly private lands, combined with the exclusion of fire, have altered forest conditions within the project area. Stand species composition has shifted from more fire resistant, shade intolerant pines to less fire resistant, shade tolerant fir and incense cedar. Prior to these activities, these stands were more open comprised of larger diameter pine dominated stands that were less susceptible to drought and fire. Frequent low to moderate intensity fires limited understory vegetation resulting in more open stand conditions. Decades of fire exclusion has resulted in increased fuel ladders and excessive accumulations of down woody material. This has increased the fire risk to communities located adjacent to the project area and to culturally significant gathering areas and sites.

A key purpose is to restore and maintain forest conditions within proposed treatment areas to more closely resemble pre-1900s stand structures. Moving stands towards desired conditions would result in forests that are more resilient and resistant to expected changes in climate and disturbance regimes. There is a need to reduce stand densities mainly within the lower and mid-canopy levels of the treated stands to promote increased growth and vigor, stimulate growth of large, insect resistant trees enabling the forest to better withstand predicted fluctuations in temperatures and precipitation, attacks from insects and diseases, and the effects of wildfires. Some of the predicted results would include acceleration of old forest (pre-1900s vegetation characteristics), improvement of stand growth and vigor, more rapid development of larger diameter trees resulting from increased growth rates, retention and perpetuation of a greater percentage of pines and oaks restoring more diverse stands while reducing the risk to wildfire loss. Other benefits include increased vegetation heterogeneity and improved wildlife habitat conditions.

A key purpose is to treat conifer stands to improve their resiliency to insect attack, diseases, wildfire, drought conditions, and increased stress on vegetation due to predicted warmer temperatures and longer periods of depleted soil moisture. Stocking levels (stand densities) have reached or are reaching density levels where declining growth and vigor is occurring from inter-tree competition thus increasing potential rates of tree mortality. A reduction in the uncharacteristically high percentage of incense cedar and fir needs to occur in order for stands to more closely resemble pre-1900s stand structure. There is a need to improve individual tree growth to accelerate the development of larger diameter, more resilient trees. Other expected benefits include improved soil productivity and hydrologic function (FEIS, page 3 to 7).

Figure 1. Whisky Ridge Ecological Restoration Project Vicinity Map

Decision and Rationale

Decision

Based on review of the purpose and need, public comments and issues, the forest plan (as amended), current policies and regulations, the analysis contained in the FEIS, and the supporting information in the project record, my decision is to implement Alternative 2, the proposed action. Table 1 displays the actions associated with the decision and provides references to where the complete description can be found in Attachment 1.

Approximately 8,263 acres will have some form of treatment. The remaining acres within the 18,285-acre project area will have no treatments due to slopes greater than 35 percent, forest plan standard and guideline limitations on treatment, or because it was determined that no treatment is needed to meet the purpose and need. Areas where follow-up treatments are needed, such as slash piling/burning, prescribed understory burning and noxious weed treatments, will be prioritized based on proximity to WUI and completed as appropriated dollars became available. Please note, many of these treatments occur on the same actual acre. For this reason, the total number of treatment acres may appear to exceed the total number of acres noted in table 1.

Table 1. Summary of Selected Alternative (Alternative 2) Treatments

Alternative 2 Treatments	Unit of Measure	Total Authorized	Location of Treatment Descriptions and Requirements in Attachment 1
Tractor - Fuels and vegetation treatments in natural stands and conifer plantations (**harvest/thin, commercial thin and mechanical pile)**	Acres	2,824	Appendix A, D, E, F
Tractor - Fuels and vegetation treatments in natural stands and conifer plantations (**pre-commercial thin and mechanical pile)**	Acres	1,881	Appendix A, D, E, F
Handwork – Fuels and vegetation treatments	Acres	200	Appendix A, D, E, F
Mastication - Fuels and vegetation treatments	Acres	520	Appendix A, D, E
Fuel break construction and maintenance (these acres overlap with Tractor treatment acres)	Acres	1,187	Appendix A, D, E, F
Reforestation (acreages are included in the acre totals)	Acres	150	Appendix A, D, E, F
Meadow restoration (conifer encroachment removal)	Acres	6	Appendix A, B, E, F
Meadow restoration (physical stabilization)	Acres	16	Appendix A, B, E, F

Alternative 2 Treatments	Unit of Measure	Total Authorized	Location of Treatment Descriptions and Requirements in Attachment 1
Meadow restoration (hand and mechanical thinning in RMA)	Acres	72	Appendix A, B, E, F
Meadow Restoration (off-site livestock water development)	Each	4	Appendix A, B, E, F
Whisky Falls Campground (hazard tree removal and thinning)	Acres	4	Appendix A, D
Whisky Falls Campground (bear box installation)	Each	9	Appendix A, D
Whisky Falls Campground (vault toilet replacement)	Each	1	Appendix A, D
Cultural resource site enhancement	Acres	100	Appendix A, D, F
Noxious weed management	Acres	5	Appendix A, B, D, E, F
Sensitive plant habitat enhancement (Rawson's flaming trumpet and mosses)	Acres	0.6	Appendix A, D, F
Terrestrial wildlife habitat restoration	Acres	7,765	Appendix A, D, F
Aquatic wildlife habitat enhancement	Miles	2	Appendix A, B, F
Road maintenance	Miles	65	Appendix A, C, D, E
Road reconstruction	Miles	33	Appendix A, C, D, E
Temporary road construction	Miles	5	Appendix A, C, D, E
Road decommission and obliterate	Miles	0.2	Appendix A, C, D, E
Restore site productivity to unauthorized off-highway vehicle routes	Miles	8.8	Appendix A, C, D
Prescribed fire (initial entry)	Acres	2,838	Appendix A, D, E, F
Prescribed fire (after structural restoration treatments have been completed)	Acres	1,776	Appendix A, D, E, F
Total Restoration Acres: 8,263 acres			

The vegetation and prescribed fire (including fuelbreak construction) treatment areas, meadow and stream restoration actions, road reconstruction and temporary road construction, forest

system road and routes to be decommissioned, livestock water construction and campground improvement components of this decision are shown on attached maps 1 to 13 in the Record of Decision Map Packet found in appendix A.

Design Criteria and Best Management Practices Included in the Decision

Based on site-specific review of the project area, resource specialists identified design criteria to reduce potential impacts. My decision requires following specific design features for aquatic and meadow restoration as displayed in appendix B. Design features for roads that will be constructed, reconstructed and maintained as well as OHV routes that will be restored are located in appendix C. All treatments will be implemented in accordance with the design features found in appendix D and the best management practices (BMPs) in appendix E.

Monitoring Included In the Decision

My decision includes implementation of the Monitoring Plan found in Appendix F.

Rationale for the Decision

Meets the Purpose and Need

I find that alternative 2 best meets the purpose and need for the project. The vegetation analysis concludes that in the long term (15 to 20 years), vegetation growth and vigor will remain high from reduced stand densities, heterogeneity will increase as competition is reduced and the potential for loss due to insects, diseases, drought will be low (FEIS, table 4). Stand conditions will move towards reference conditions. Both wild stands and plantations will make the most progress towards increasing the presence of large diameter trees with the estimated range being 20 to 29 inches diameter at breast height (dbh) in wild stands and up to 18 inches dbh in plantations. (FEIS, page 58). As forest heterogeneity and forest health increases, biodiversity will increase.

The fire analysis concludes that only alternative 2 reduces the predicted mortality from wildfire from a range of 0 to 100 percent to a range of 0 to 69 percent. Treatment design, which includes strategic placement and attention to defense zones, will modify the intensity and rate of spread of wildland fires near communities and across the landscape. Treatments will increase our ability to control wildland fires in this area. About 4,620 acres will be within the desired departure condition class fire interval 1 (CCFRI 1) and will have surface fire as the expected fire type. This will meet the desired condition of returning fire to the landscape and maintaining acres in a CCFRI 1 in the long term (FEIS, pages 57, 174 to 194).

The selected alternative meets the need of maintaining or restoring soil productivity and hydrologic function. The design of the vegetation treatments will increase coarse woody debris and move towards the desired 5 to 20 tons per acre. This will protect and maintain soil productivity and increase soil hydrologic function/water retention (FEIS, pages vi, 239-244). The decommissioning, reconstruction, and maintenance of system roads and the restoration of OHV routes will improve watershed condition by reducing hydrologic connectivity , water quality impacts from sedimentation, and move the subdrainages toward a more stable and resilient condition. In the long term, meadow restoration and off-site livestock water developments will

reduce the amount of erosion and impacts on water quality for downstream (FEIS, Chapter 3, page 259).

Alternative 2 best meets the need of improving wildlife habitat while reducing potential impacts. Over 7,000 acres of habitat will be restored. Heterogeneity and stand diversity will be high and old forest linkages (OFL) will be delineated around perennial streams. Higher levels of biodiversity will be achieved by retaining groups of large diameter trees with higher basal areas. Design measures will maintain habitat connectivity, special habitat elements for terrestrial wildlife species, and limit the amount of behavioral disruption during project implementation and post-treatment. The design measures were developed through a collaborative process, the Sierra Nevada Adaptive Management Project (SNAMP) Integration Team (FEIS, pages 285-286, 291-292).

This decision will result in short term effects to habitat as canopy closure will be altered on 260 acres (approximately 3 percent of the treatment area). The projected changes to California Wildlife Habitat Relationships (CWHR) may result in short term effects in the way terrestrial wildlife species utilize the habitat. Individuals may leave treatment areas during project implementation, and will likely rely more heavily on other areas of their home range. There will be long term (10 to 15 years) benefits as the canopy cover in the project area convert to higher quality habitat, remaining tree crowns grow, and the understory develops. The resulting stands will show increased health, growth rate, and resistance to large scale stand replacing wildfire. Implementing this decision will not result in a trend toward Federal listing or loss of viability for Forest Service sensitive species. It will not alter the existing trend in the habitat at the project-level, nor will it lead to a change in the distribution or populations of management indicator species (MIS) across the Sierra Nevada bioregion (FEIS, page 282 to 328).

In the long term, the risk of insect and disease will be low, there will be reduced risk of vegetation and habitat mortality from fire; and, fire will be returned to the landscape. This directly translates into increased resiliency to disturbances, to increased sustainability, and improved forest health on over 8,000 acres. I found that alternative 2 best meets the purpose and need by effectively using a combination of vegetation, fire and watershed treatments that will improve resiliency and function that results in a more sustainable forest (FEIS, page 53 to page 350).

Addresses Environmental, Cultural, and Social Issues and ConcernS

My decision authorizes 8,263 acres of treatment designed to increase resiliency and function within the Willow Creek Watershed. This decision is the result of a collaborative process that began in 1995 when the forest completed the Willow Creek Landscape Analysis. In March of 2012, an addendum to the landscape analysis was prepared as part of a collaborative planning process known as the Willow Creek Planning Collaborative, The addendum outlines community values/beliefs, desired conditions and suggested management strategies for the watershed and the design of this project largely came from the group’s recommendations.

Public comments received during scoping and in response to the draft EIS provided additional opportunities to consider the design of the project. Public comments included concerns over treatments that would cut larger diameter trees (trees greater than 10 inches dbh), actions that would increase road impacts, actions that would negatively affect air quality and emissions, wildlife habitat and culturally important gathering areas, actions would remove OHV routes that

are used and provide connectivity to other designated routes, operating restrictions that would hinder removing forest products, and an incomplete social and economic analysis.

Larger Tree Removal (Greater Than 10 Inch DBH)

There was a concern that large trees would be unnecessarily removed. There was a concern that cutting larger trees would not decrease fire risk, would increase large tree mortality, would decrease heterogeneity, and would negatively impact wildlife habitat. This issue was addressed in the draft EIS by the development of alternative 3 and through disclosure in environmental consequences. I addressed this issue by requiring additional analysis on post-treatment large trees and tree mortality. (FEIS, page 204 to page 218) The fire analysis indicates fire risk will be decreased to the greatest extent in alternative 2. The vegetation analysis states that stands/aggregations are presently too dense and need thinning to maintain or improve growth and vigor and move them towards forest plan goals. Thinning is directed by the forest plan and larger trees will remain in the stand. Predominant trees (the oldest) will remain. In alternative 2, commercial thinning will occur on 15 percent of the project area, leaving 85 percent of the project area with the same number of larger trees as present today (FEIS, page 205). Thinning will remove the felled material from the site thus reducing future fuel loadings. Large tree growth will be increased by increasing tree resilience and decreasing tree competition which promotes forest health. The vegetation analysis indicates there will be increased heterogeneity and more large trees in the long term than would have resulted under the other alternatives (FEIS, table 4).

To address concerns related to Pacific fisher and marten habitat, design features that address snags and the retention of large trees will be followed. Snags will be felled only if they meet the definition of a danger tree, have the potential to fall across prescribed fire control lines, comprise fuel break integrity, and/or pose a threat to firefighter safety during prescribed fire implementation. Dense groups of large trees (greater than 30-inch dbh) with touching crowns will be retained at the rate of approximately one group per 2.5 to 3.5 acres. Ideally these groups would contain “defect” trees, those that have cavity and platform creating defects (mistletoe, rot, fork topped, broken limbs and tops) for Pacific fisher denning and resting sites. Within these large tree groups, all trees over 20” dbh will be retained. These large tree groups will generally have a residual basal area of 240 ft^2 or more for mixed conifer and 210 ft^2 or more for pine and in many instances may reach 300 to 400 ft^2 per acre. Retention of these large tree groups with higher basal areas and the inclusion of defect trees are designed to maintain the integrity of suitable fisher denning and resting sites throughout the treatment units. Non-treated areas within proposed treatment units, such as riparian areas and steep slopes, will also provide extensive areas of tree group retention as no treatments will be occurring in these areas (FEIS, page 41 to page 44). My decision may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for the Pacific fisher and American marten (FEIS, page 305 and 311).

Public comment to the draft EIS related to wildlife and cavity-nesting snag habitat resulted in the modification of Alternative 2. For example, comments from the John Muir Institute resulted in a modification of the fire treatments to include pockets of high intensity fire to create pocket of contiguous snags for the blackbacked woodpecker and to improve spotted owl foraging habitat. Treatments were also modified to include snag-creating treatments such as girdling and/or topping of trees where inventory data indicated a deficit of snags in the larger size classes (> than 15 inch dbh trees) (FEIS, page 20). A summary of the terrestrial wildlife analysis including discussion on cavity-nesting wildlife can be found in Chapter 3, Wildlife - Terrestrial section of

this document. My reasons for not selecting alternative 3, which would have limited vegetation treatments to 10 inch dbh, are further articulated in the next section of this Record of Decision.

Temporary Road Construction Impacts

There was a concern over direct, indirect and cumulative effects from temporary road construction. My decision addresses both the existing road system and the temporary roads needed to implement the project. The existing road system is currently in poor condition and in need of maintenance. In their current state of disrepair, the roads in the project area are increasing hydrologic connectivity, contributing to increased sediment input and causing overall watershed and water quality degradation. My decision authorizes maintaining and improving 98 miles of road to be used for project in a manner that provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities, all of which can cause erosion, sedimentation, and deteriorating watershed conditions. While the creation of 5 miles of temporary roads could affect watershed condition and function if not implemented properly, my decision incorporates conservation measures that will be implemented to control erosion and sedimentation. The implementation of design features and BMP's (Appendix B-E) will avoid or minimize potential increases in sediment loads to streams. Over the longer term, potential adverse effects on water and soils from project implementation are expected to be minor, and substantially less than if wildfire were to occur (FEIS, Chapter 3, pages 219 to 262).

Adverse Impacts to Human Health from Prescribed Fire and Increased CO_2 Levels in the Atmosphere

This decision incorporates the recommendations from the San Joaquin Valley Air Pollution Control District (District) and the Environmental Protection Agency. In accordance with the California Code of Regulations, Title 17, implementation of this decision will require the submittal of a Smoke Management Plan (SMP) to the air district of jurisdiction and: 1) receive a permit to burn, 2) receive authorization to burn on a given day, and 3) maintain communication with the local air district and report on the status of the burn until it is concluded (FEIS, page 75).

I acknowledge that restoration comes at a price, the potential for people to be adversely affected by smoke. Communities, State Highways, Class I Airsheds, and recreation sites are considered smoke sensitive receptors where smoke and air pollutants can adversely affect public health, safety and welfare. Although there are no Class 1 Airsheds in the project area, adjacent areas were part of the air quality analysis (FEIS, page 76). These areas could be affected by smoke if weather patterns produce a stable air mass and smoke is unable to vent into the upper atmosphere. Since $PM_{2.5,}$ PM_{10} and ozone are public health hazards, prescribed burns will be planned during periods of unstable air, which will allow for proper ventilation of smoke and temperatures less than 95 degrees. However, since prescribed underburns could last for several days or weeks there is the potential for recurring shifts in air masses toward more stable conditions. For this reason, all prescribed fire activities will be coordinated with the District and will be implemented under optimum conditions using best available control measures to prevent smoke concentrations from affecting local communities. The environmental consequences associated with the use of prescribed fire are disclosed in the FEIS (Chapter 3) on page 82 to page 88.

The Environmental Protection Agency (EPA) has developed *de minimus* levels for each of the criteria pollutants based on an air basins attainment status for each pollutant. For emissions occurring in the San Joaquin Valley, the applicable *de minimis* thresholds are based on the San

Joaquin Valley's current attainment status: extreme nonattainment for ozone, nonattainment for $PM_{2.5}$, and maintenance for CO and PM_{10}. Table 7 in the FEIS (FEIS, page 73) displays the applicable *de minimis* threshold. I find that this project meets the State of California's General Conformity Rule; it does not interfere with the strategies employed to attain national ambient air quality standards (NAAQS). The emissions from this project are considered regionally insignificant (total emissions are less than 10 percent) of the area's total emissions inventory for $PM_{2.5}$, PM_{10}, and NOx. The carbon emissions produced will be 1,131,465 tons which is 9 percent less than alternative 1 (no action) (FEIS, page 87 to page 88).

Adverse Effects to Cultural Resources and Native American Gathering Sites

There are approximately 136 cultural resources and several miles of historic linear resources that have the potential to be affected by my decision. All but two of the cultural resource sites and features in the project will be protected through the application of Approved Resource Protection Measures (ARPMs) of the Regional Programmatic Agreement (USDA 2013) and Region 5 Hazardous Fuels Protocol or design criteria and thus will have no direct effects. The Sugar Pine Lumber Company historic railroad logging system as well as the historic Whisky Falls Campground will potentially be adversely affected by project implementation. I have determined that the forest will consult with the California Office of Historic Preservation (SHPO) and the Advisory Council on Historic Preservation (ACHP) to develop Memorandums of Agreement for each property in order to mitigate all adverse effects to these cultural resources.

This decision allows prescribed burning through designated cultural sites to reduce fuel loading and prevent future loss of data potential from excessive heat damage and minimize the need for suppression actions. Prescribed burning through archaeological sites will be carefully controlled and monitored during implementation. I find that with design features and the application of the Regional PA and Region 5 Hazardous Fuels Protocol, this decision will have a beneficial effect on cultural resources and enhance their character defining attributes (FEIS, page 148 to page 154).

If cultural gathering areas are identified, this decision that includes design criterion 7 for Cultural Resources address this concern. If gathering areas are identified to the Sierra NF, the forest will coordinate with the tenders of these areas prior to and during project implementation to ensure they are properly managed. Another gathering area actively managed on the forest has benefitted from hand thinning, brush piling, and underburn treatments that are similar to those approved in this decision and has resulted in a significant increase of culturally gathered plants available for collection that were previously smothered by thick forest litter and duff. I find that this decision will enhance these traditional gathering areas and will benefit the resource through active management (FEIS, page 148 to page 154). I find my decision responds to this issue by restoring and enhancing culturally gathered plant materials. See Chapter 3, Botany and Cultural Resource section of the FEIS.

Reconsideration of OHV Routes to Be Restored

In review of comments received, we found data errors. In addition, comments indicated some of the OHV routes proposed for restoration were highly valued to motorized users as they provided connectivity to other designated motorized trails. Alternative 2 was modified to reflect these comments. This decision will restore approximately 9 miles of OHV routes, a reduction in miles from the original proposal.

Implementation Restrictions

Comments were received from industry questioning the need for the restrictions to operating periods. Most timing restrictions are required by the forest plan in order to protect soil and water quality and reduce the impact to nesting and breeding wildlife. Upon further review of the limited operating periods (LOP), one LOP was removed and one LOP was revised (see FEIS, Appendix K).

Social and Economic Impacts

Comments received from industry questioned the lack of history related to the mills in central California which have affected the social and economic well-being and sustainability of small communities, including those in the project area. The decline in mills was specifically of concern. In response to this comment, the economic analysis was revised to include a history of the mills and additional information on the economic impacts of the alternatives to better reflect local socio-economic concerns.

Best Available Science

I find that this analysis was based on the use of the best available science and information. I adopted all practicable means to avoid or minimize environmental harm in the design of this project as displayed in appendix A through appendix E of this decision. I included all of the project design criteria that I believe are necessary to avoid, minimize, or rectify impacts on resources affected by the implementation of this decision. My conclusions are based on a review of the record that is based on the use of the best science and information.

The resource sections in Chapter 3 of the FEIS identify the effects analysis methodologies, reference scientific sources which informed the analysis, and disclose analysis or data limitations. Chapter 1 of the EIS discusses our regional efforts since 2006 to work with other Federal and State agencies and the University of California to further study the effects of management actions related to wildlife (Pacific fisher and California spotted owl), fire and forest health, water quality and quantity, and public participation (FEIS, page 2). Using the best available information includes knowledge gathered through collaboration. This analysis is largely based on the key issues and values the public identified for the Willow Creek watershed (FEIS, page 2 to page 3). Opposing views were considered and findings documented in the Response to Public Comments appendix (FEIS, Appendix K) and in the Chapter 3 resource sections of the FEIS as applicable (FEIS, page 66 to page 348).

Alternatives Considered in Detail But Not Selected

In addition to the selected alternative, I considered two other alternatives which are summarized below:

Alternative 1 – No Action: This alternative was developed based, in part of, using the "Indicators" for the significant issues #2, 3, and 9 where no tree removal, harvesting, mechanical and prescribed burning treatments are proposed under this alternative. Under the no action alternative, current management plans would continue to guide management of the project area however no actions would be taken to implement those plans at this time or without additional environmental analysis. No restoration treatments would be implemented to accomplish project goals.

Alternative 3 – Lower and Limited Mid-level Canopy Treatments, All Treatment Areas: In alternative 3, treatment areas would remain the same as in Alternative 2, treatments within these areas would include only those needed to reduce the surface and ladder fuels (within the lower and limited mid-level canopy levels) to achieve fire and fuels objectives. Under alternative 3 there would be no additional treatment (i.e. additional thinning in the mid-level canopy) to fully address stand density and forest resiliency objectives. This alternative was developed based, in part, using the "Indicator" for the significant issue 1 where a higher degree of canopy cover would remain after the treatment and stand densities would remain higher because trees over ten inches would not be treated under this alternative as in the proposed action.

Alternatives Considered But Eliminated From Detailed Study

I also considered four alternatives that were eliminated from detailed study, summarized below. Additional detail can be found in Chapter 2 of the FEIS.

1. **An alternative was suggested to use only hand cutting crews and no burning to reduce fuels since the smoke from prescribed fire may put human health at risk and increase global warming.** This issue was not considered in detail and eliminated because the use of handwork alone would not meet the purpose and need. The use of handwork alone would not achieve the benefits of prescribed fire (e.g. to provide a flush of soil nutrients to increase the diversity of plants and invertebrates) nor would it be economically feasible.

2. **An alternative was suggested that would use only prescribed fire (preferably including mixed-intensity effects to recruit large snags for cavity-nesting species) and no thinning on the acres proposed for mechanical/commercial thinning**. This alternative was eliminated from detailed study because the use of prescribed fire alone without mechanical thinning will not meet the purpose and need of reducing stand densities and shifting the incense cedar and fir component of the stands to bring the pine composition back to the historic range of variability and improve resiliency to insect attack, disease, wildfire, drought conditions (e.g. potential increased stress on forest vegetation due to predicted warmer temperatures and reduced soil moisture due to climate change).

3. **An alternative was suggested that would "within the acres of forest proposed for mechanical/commercial thinning, instead of the live trees over 16" dbh being removed, the trees that would otherwise be marked for removal would instead be girdled or killed in some other way in order to actively recruit more large snags for wildlife, or such trees would be felled to provide large downed log structure for small mammals, amphibians, and invertebrates".** This alternative was considered but eliminated because implementation will make the project area more susceptible to potential impacts from an uncharacteristically severe wildfire (due to heavy fuel loading and density). The alternative will not meet the purpose and need to treat conifer stands to improve their resiliency to insect attack, diseases, wildfire, drought conditions, and increased stress on vegetation (due to predicted warmer temperatures and longer periods of depleted soil moisture). Approximately 30 to 70 percent of the trees 10 inches dbh and larger that will be removed for density management are in the 16" dbh and larger size class.

4. **An alternative based on the recommendations of Cohen.** This alternative was eliminated because it would not meet the restoration objectives of the purpose and need for the project or the fuel reduction objective. Cohen (2008) suggests that most homes are not lost as a direct result of flames from high intensity wildfire. However, his studies did conclude that some homes were lost directly from flaming fronts, while others suffered ignition due to firebrands and spot fires that ignited fuels on and around the homes. So, while it is important for homeowners to do their part in making their homes fire safe, that is only one half of the fire safe equation. The Forest Service has no control over their actions. Since firebrands were identified by Cohen (2008) as a source of ignition of homes, reducing the potential for firebrands by the proposed fuel reduction would add protection to homes in the project area. Another consideration is firefighter safety in protecting structures and public safety in terms of egress from the fire area during a high intensity fire.

Public Involvement

Scoping

A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Whisky Ridge project was published in the Federal Register (vol.77, no. 70, pp. 21,721) on April 11, 2012. The notice asked that comments on the proposed action be received no later than 30 days after the publication date. The scoping letter was sent on April 13, 2012 to 223 residents within 1.5 mile radius of the project area, to members and groups in the Native American community, to publics expressing interest in the project, and to other State and Federal agencies (see FEIS, Chapter 4). The total mailing list was 579. The project was also listed in the SNF Schedule of Proposed Actions (SOPA) beginning in January, 2012. On June 13 & 27, 2012 the Forest Service held public field trips to the project area. The scoping letter included an invitation to participate in the field trip and a news release announcing the public meeting was published in the Sierra Star (local newspaper) on June 14, 2012. The public field trips were attended by over 60 individuals.

There were 10 scoping period respondents, all of whom raised concerns and issues regarding the proposed project. All of the responses are in the project record on file at the Bass Lake Ranger Station. Using the comments from the public, the interdisciplinary team developed a list of issues to address. Some of these issues led to the development of alternative 3.

On February 22, 2013, the notice of availability (NOA) for the draft EIS was published in the Environmental Protection Agency's section of the Federal Register (vol.78, no. 36, pp. 12,310). The publication of the NOA initiated the 45-day comment period on the draft EIS. The legal notice announcing the availability of the draft EIS for comment was published in the forest's newspaper of record, *Fresno Bee*, on February 22, 2013. The draft EIS and supporting documents (specialist reports) were posted to the forest's website (

Tribal Government and Native American Interests

On March 13th, 2012 the Bass Lake District Ranger and staff met with the North Fork Rancheria of Mono Indians of California Tribal Council at their US Forest Service quarterly meeting at the Tribal Community Center in North Fork, California. Maintaining gathering areas was highlighted as a concern. On August 15, 2012, a project overview was presented to Tribal representatives and Tribal group representatives at the Sierra NF/Tribal Forum. Participants included the North Fork Mono Tribe, Cold Springs Rancheria of Mono Indians, Picayune Rancheria of Chukchansi Indians, North Fork Rancheria of Mono Indians, Mono Nation, Big Sandy Rancheria of Mono Indians and Table Mountain Rancheria.

Consultation with tribes, local Native American communities, and other interested parties (to identify other cultural values, including contemporary Native American interests) was initiated with a scoping letter on April 13, 2012. The letter was sent to members and groups in the Native American community. Many members attended the project field trips held on June 13, 2012 and June 27, 2012. In addition to this project, many members of the Native American community have been involved in the Willow Creek Collaborative effort. The Willow Creek Collaborative effort informed the desired conditions and proposed actions for this project. Consultation has consisted of meetings, letters, and presentations, and is documented in the project record. One concern from the tribal community regarding cultural gathering areas was received. Maintaining cultural sites and sustaining cultural gathering areas was incorporated into the purpose and need and the selected alternative.

Publication of the Draft Environmental Impact Statement

On February 22, 2013, the notice of availability (NOA) for the draft EIS was published in the Environmental Protection Agency's section of the Federal Register (vol.78, no. 36, pp. 12, 310). The publication of the NOA initiated the 45-day comment period on the draft EIS. The legal notice announcing the availability of the draft EIS for comment was published in the forest's newspaper of record, *Fresno Bee*, on February 22, 2013. The draft EIS and supporting documents (specialist reports) were posted to the forest's website (

explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)". A list of non-significant issues and reasons regarding their categorization as non-significant may be found at Bass Lake Ranger District in North Fork, California in the project record.

The Forest Service identified the following significant issues during scoping:

1. *The proposed action to remove trees about 10 inches up to 30 inches in diameter would not reduce the potential for high-intensity and severity fires.*

This issue was addressed in the draft EIS by the development of Alternative 3 which would not cut trees greater than 10 inches. See the alternative 3 description in Chapter 2. A summary of the fire/fuels analysis and potential for active crown fire as well as the units of measure used to evaluate environmental consequences can be found in Chapter 3, Fire/Fuels section of this document. Based on comments from the public, minor corrections to basal area and the number of trees were made to the vegetation analysis; and, additional analysis on the potential environmental consequences to trees 30 inches and larger (considered leave trees) was provided in all alternatives.

2. *The prescribed burning elements of the proposed action may cause smoke that may adversely affect human health.*

This issue was addressed in the draft EIS through the disclosure of environmental impacts related to using prescribed fire (burning). Alternative 1 responds to this issue because no prescribed burning is proposed. Alternative 2 and 3 disclose the effects of conducting prescribed burning. A summary of the fire/fuels analysis and prescribed burning can be found in Chapter 3, Fire/Fuels section of the FEIS.

3. *The proposed burning may increase CO_2 levels in the atmosphere leading to atmosphere warming.*

This issue was addressed in the draft EIS through the disclosure of environmental impacts. Alternative 1 best responds to this issue because no mechanical or prescribed burning treatments were proposed. The potential impact to carbon levels was evaluated in all alternatives. A summary of the air quality analysis and CO_2 levels can be found in Chapter 3, Air Quality section of this document. The environmental consequences were updated in the final EIS to reflect comments and recommendations from the San Joaquin Valley Air Pollution Control District and the Environmental Protection Agency.

4. *The proposed action would not provide enough high intensity fire for spotted owl foraging.*

This issue was addressed in the draft EIS by adding several pockets of high intensity prescribed burning to alternative 2. See the alternative 2 description in Chapter 2 of this document. The environmental consequences associated with this type of treatment in spotted owl foraging habitat is summarized in Chapter 3 in the Wildlife - Terrestrial section of the FEIS.

5. *The proposed action would not provide enough suitable habitat for the sustainability of the black-backed woodpecker population.*

This issue was addressed in the draft EIS through the disclosure of environmental consequences and through minor modification of alternative 2. All alternatives evaluate the effects to habitats and populations trends of management indicator species, including the black-backed woodpecker. In addition, the proposed action (alternative 2) was modified from initial scoping to include a more specific proposal that responds to this issue by proposing to include pockets of high intensity fire to create pocket of contiguous snags. See the alternative 2 description in Chapter 2 of this document for the detailed proposal. A summary of the terrestrial wildlife analysis and Black-backed Woodpecker habitat can be found in Chapter 3, Wildlife - Terrestrial section of the FEIS.

6. *The proposed action may decrease future large snag density potentially resulting in adverse impacts to cavity-nesting wildlife species.*

This issue was addressed in the draft EIS through the disclosure of environmental consequences and through minor modification of alternative 2. All alternatives evaluate the effects to habitats and populations trends of management indicator species (MIS), including those that rely on a supply of snags and live decadent trees suitable for cavity nesting wildlife across a landscape (DEIS, pp. 326-327). The MIS evaluated include the black-backed woodpecker, a species noted in public comment. Alternative 2 responds to this issue because it includes a proposal for several high intensity burn areas to create pockets of desirable snags and burned habitat (for cavity dependent species such as the black-back woodpecker). In response to public comment, alternative 2 was modified to include snag-creating treatments such as girdling and/or topping of trees where inventory data indicated a deficit of snags in the larger size classes (> than 15 inch dbh trees). See the alternative 2 description in Chapter 2 of this document. A summary of the terrestrial wildlife analysis including discussion on cavity-nesting wildlife can be found in Chapter 3, Wildlife - Terrestrial section of the FEIS.

7. *The proposed action may decrease vegetation heterogeneity (montane chaparral, snags and downed logs) which may reduce native biodiversity.*

This issue was addressed in the draft EIS through the disclosure of environmental consequences. All alternatives evaluate how heterogeneity across the landscape is affected. Alternative 2 responds to this issue because it proposes to promote heterogeneity through structural and process restoration treatments. See the alternative 2 description in Chapter 2 of this document. A summary of the can be found in Chapter 3, Botany (montane chaparral), Wildlife Terrestrial (snags and downed logs), and Fire/Fuels (high severity fire) section of the FEIS.

8. *The proposed action may adversely affect Native American gathering sites.*

This issue was addressed in the draft EIS through the disclosure of environmental consequences. All alternatives evaluate how the potential impact to important Native American gathering materials. Alternative 2 responds to this issue by proposing to restore and enhance culturally gathered plant materials. See the alternative 2 description in Chapter 2 of this document. Also, a summary of the botany and cultural resource analysis and native plants can be found in Chapter 3, Botany and Cultural Resource section of the FEIS.

9. *Removal of mature trees under the proposed action may result in a higher tree mortality rate than would occur without the project, reducing future snag recruitment.*

This issue was addressed in the draft EIS through the disclosure of environmental consequences and alternative development. The silviculture report discloses the potential for actions to affect tree mortality and snag recruitment in all alternatives. Alternative 1 responds to this issue as no tree removal would occur. In response to public comment, alternative 3 was developed. In alternative 3, no trees greater than 10 inch dbh would be cut. Therefore, no commercial trees would be harvested. A summary of the silviculture analysis and tree mortality can be found in Chapter 3, Silviculture section of the FEIS.

Changes from Draft EIS to Final EIS

Based on public comment, Forest Service review or additional analysis, changes were made between the draft EIS and the final EIS:

Data Corrections, Additions and Clarifications

- Silviculture: Minor corrections to basal area and the number of trees were made to the vegetation analysis; and, additional analysis on the potential environmental consequences to trees 30 inches and larger (considered leave trees) was provided in all alternatives (see Chapter 3, Silviculture section). No correction or data inclusion resulted in a change in silviculture environmental consequences.
- Wildlife: The wildlife biological evaluation incorporated the new silviculture information and corrections related to basal area and large trees and updated the projected habitat recovery timeframes. The effects analysis was updated to include new (2012) research for the California spotted owl. In addition, based on additional analysis acres of terrestrial wildlife habitat restoration in alternative 2 was corrected (increased).
- Air Quality: The air quality report was updated to incorporate recommendations provided by the San Joaquin Valley Air Pollution Control District and Environmental Protection Agency.
- Socio-Economics: The economic analysis was updated to provide additional information on the history (decline) of sawmills. Additional analysis was conducted on employment and direct/indirect jobs and costs and values were updated. Biomass harvest methods and costs were added to the analysis. A social environment report that is located in the project record was developed to provide additional information on population and demographics in the planning area.
- Cultural Resources: The cultural resources analysis was updated to incorporate the need to develop Memorandums of Agreement with SHPO and ACHP to mitigate potential adverse effects to the Sugar Pine Lumber Company historic railroad logging system and the historic Whisky Falls Campground.

Document Corrections and Edits

- Typographical or formatting errors were corrected and maps were edited or developed to better reflect project locations and treatment types.
- In the summary section (DEIS, page iv) objective number 10 was edited to remove any inaccurate reference to travel management.

- Due to Supreme Court ruling the references to the need for National Pollution Discharge Elimination System (NPDES) was eliminated from chapter 3, Hydrology/water quality report (US Supreme Court 2013).
- Information in other required disclosure section was updated to reflect all permits required.

Alternative Modifications

- As a result of additional analysis, the final acres proposed for treatment in alternative 2 and 3 was reduced from 9,200 to 8,263 acres and the acres of meadows restored was corrected. No changes were made to proposed vegetation treatment types or locations as presented in the DEIS. However, approximately 1.6 miles of OHV routes were removed as a result of public comment.
- Design Criteria Common to all Action Alternatives: Limited operating period language was edited to add clarity on applicable vegetation (green versus old or dead) or deleted.
- A goal (DEIS, page 19) related to restoring unauthorized routes in accordance with the travel management process was edited to better reflect the intent of the project.

Coordination with State, County, and Municipal Agencies

The Sierra NF requested and received technical advice from the USFWS to address uncertainty related to candidate species. Their advice is integrated extensively throughout the terrestrial species sections of Chapter 3 as well as in the design criteria for all action alternatives. The SHPO, ACHP, and the Forest Service have initiated consultation and are in the process of developing MOAs for the project which will fulfill the regulatory requirements for compliance with Section 106 of the National Historic Preservation Act. The forest worked with the San Joaquin Pollution Control District and the Environmental Protection Agency (Region 9) and included their comments and recommendations into the fuels and air quality analysis. The Madera County Board of Supervisors, District 5, participated in scoping field trips. State agencies, including the Central Valley Regional Water Control Board, the Sierra Nevada Conservancy and the California Department of Fish and Game, participated in the scoping field trips. See the project record for documentation.

Environmentally Preferred Alternative

The NEPA implementing regulations (Section 1505.2) require that the alternative(s) that best promotes national environmental policy as expressed in NEPA, Section 101, be identified in the decision as the “environmentally preferable alternative” or alternatives. This is ordinarily “the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources” (FSH 1909.15, 05).

The environmentally preferable alternative is not necessarily the alternative that would be implemented, and it does not have to meet the underlying need for the project. It does, however, have to cause the least damage to the biological and physical environment and best protect, preserve, and enhance historical, cultural, and natural resources.

I believe alternative 2 is the environmentally preferable alternative. Although this alternative uses both non-commercial and commercial methods to treat vegetation in order to move towards desired conditions, it provides the most resource benefit in terms of long term resiliency and sustainability. In the long term (up to 15 to 20 years), vegetation growth and vigor will remain high, heterogeneity will increase and the potential for loss due to insects, diseases, drought will be low (FEIS, table 4). In alternative 1 and 3, the converse is expected.

While both action alternatives included restorative actions for meadows, stream habitats, roads, and unauthorized routes, only alternative 2 reduces the predicted mortality from wildfire from 0 to 100 percent (alternative 1 and 3) to a range of 0 to 69 percent, results in about 4,620 acres being within the desired departure condition class fire interval 1 (CCFRI 1) and has surface fire as the expected fire type.

Alternative 3 would result in less impact to hydrology (water quality) from thinning that concentrates on ladder and surface fuels within the lower and mid-canopy levels (no commercial). However, when compared to alternative 2, neither alternative would exceed the upper threshold of concern (14 percent) within subdrainage 504.1004 (FEIS, table 4). Alternative 3 would not change California Wildlife Habitat Relations (CWHR) type, size, or density whereas alternative 2 will alter canopy closure on 260 acres (approximately 3 percent of the treatment area). However, more importantly, neither alternative would alter the existing trend in the habitat at the project-level, nor would it lead to a change in the distribution of the aforementioned terrestrial MIS across the Sierra Nevada bioregion. Alternative 2 provides the most long term stability for visual resources (scenic integrity and stability) as it promotes sustainability in attributes that include large trees and diverse vegetation (FEIS, table 4).

Findings Required by Law and Regulation

Clean Air Act of 1970

The Clean Air Act of 1970 and its amendments provide for protecting and enhancing the nation's air resources. The air quality report concludes that actions authorized by this decision will not cause or contribute to any violation to the air standard for the project area. Federal and State ambient air quality standards will not be exceeded as a result of implementing this decision (FEIS, page 81 to page 87). In accordance with the California Code of Regulations, Title 17, the Forest Service will submit a smoke management plan to the San Joaquin Valley Air Pollution Control District (District) and a permit will be obtained authorizing prescribed burning. Communications with the District will be maintained as until each burn is concluded. This decision complies with the Clean Air Act.

Clean Water Act

The Clean Water Act, as amended, regulates dredging and filling freshwater and coastal wetlands. Section 404 (33 USC 1344) of the Clean Water Act prohibits discharging dredged or fill material into waters (including wetlands) of the United States without first obtaining a permit from the U.S. Army Corps of Engineers. Wetlands are regulated in accordance with federal Non

Conservation measures will control erosion and sedimentation and the use of best management practices (BMPs) will avoid or minimize potential increases in sediment loads to streams during project implementation. Over the long term, potential adverse effects are expected to be minor, not exceeding thresholds of concern. The decommissioning, and/or maintenance of system roads and the restoration of OHV routes will improve watershed condition by reducing hydrologic connectivity , water quality impacts from sedimentation, and move the subdrainages toward a more stable and resilient condition (FEIS, Chapter 3, Hydrology/Water Quality, page 255 to page 256). This decision will improve conditions with respect to sedimentation on State-listed impaired streams (Final EIS, Chapter 3, Water and Soil section). This decision complies with the Clean Water Act.

Endangered Species Act of 1973

The Endangered Species Act (ESA) (16 USC 1531 et seq.) requires that any action authorized by a Federal agency does not jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of the critical habitat of such species. The Forest Service is directed to comply with this Act and has done so through Biological Assessments that are used to analyze the effects of the proposed alternatives. These assessments and evaluations make determinations on Federally-listed endangered, threatened, candidate and proposed species and their habitat. The analysis was conducted in part to determine whether formal consultation or conference is required with the United States Department of the Interior, Fish and Wildlife Service, pursuant to this Act.

The terrestrial wildlife, aquatic and botanical assessments indicates there are no federally threatened or endangered botanical, or aquatic species potentially affected by the project (FEIS, pp. 95 to 99, 121 to 122, 286 to 289). The FEIS documents that informal consultation with the US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.), was initiated by the Forest Service on March 27, 2013 for this project with the request for technical assistance related to incorporating design features for the Pacific fisher, a Candidate species. The selected alternative (which tiers to the biological evaluation) incorporates numerous design measures to protect key fisher habitat and incorporates five technical assistance recommendations (FEIS, page 291) that were provided by USFWS for another Sierra NF restoration project with similar actions (USFWS 2012). The wildlife analysis concludes that implementing the selected alternative (alternative 2) will not contribute to significant cumulative effects to Pacific fishers or their habitat. This determination is supported by recent findings published by both the USFWS and the State of California with regard to fisher population viability and habitat sustainability (FEIS, pages 297 to 299, 306 to 311). Regional USFS biologists are currently in the process of convening an interagency Fisher Technical Team (FTT) to develop the core of the Southern Sierra Fisher Conservation Strategy, designed to be a living strategy that can adapt to new research as it is published.

My decision, through the inclusion of design criteria for species covered under this Act, in consideration of the analysis and determinations contained in Biological Assessments and Evaluations for Botanical (J. Clines 2013), Aquatic Wildlife (P. Strand 2013), and Terrestrial Wildlife (A. Otto 2013) species, is in compliance with the ESA. Additionally, as there are no federally threatened or endangered botanical, terrestrial wildlife or aquatic species potentially affected by the project, I find this decision fully complies with Section 7 of the Endangered Species Act.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires Federal agencies to complete detailed analyses of proposed actions that significantly affect the quality of the human environment. The Act's requirement to prepare an environmental analysis is designed to provide decision-makers with a detailed accounting of the likely environmental effects of a proposed action prior to adoption and to inform the public of (and encourage comments on) such effects. The Final EIS analyzes the alternatives and displays the environmental effects in conformance with NEPA standards. The procedural requirements of the NEPA have been followed.

National Forest Management Act

The National Forest Management Act (NFMA) amends the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) and sets forth the requirements for Land and Resource Management Plans (Forest Plans) for the National Forest System. I have included design criteria as part of my decision to minimize or eliminate significant environmental effects from this project. I have included standards and guidelines from the Sierra National Forest Land and Resource Management Plan (forest plan) and the Sierra Nevada Framework Plan Amendment Record of Decision as amended (USDA-FS 2004b) in the design of this project.

My decision to select the actions provided by alternative 2 is consistent with forest plan goals and objectives, standards and guidelines, as documented in the resource sections in Chapter 3 of the FEIS and in "Rationale for My Decision." I have determined this project complies with this Act.

National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to consider the potential effects of a preferred alternative on historic, architectural, or archaeological resources that are eligible for inclusion on the National Register of Historic Places (NRHP) and to afford the President's Advisory Council on Historic Preservation (ACHP) an opportunity to comment. Section 110 of the Act requires Federal agencies to identify, evaluate, inventory, and protect NRHP resources on properties they control. Potential impacts to archaeological and historic resources have been evaluated in compliance with Section 106 of the NHPA.

The Pacific Southwestern Region of the Forest Service developed a programmatic agreement (PA) with the State Historical Preservation Office (SHPO) and ACHP in order to more effectively and efficiently comply with the NHPA and to better manage cultural resources on National Forest System lands in Region 5. This PA spells out standard resource protection measures and inventory protocols that are to be utilized for Forest Service undertakings in the region. The PA has been utilized to develop treatments under alternative 2 to protect 134 of 136 cultural resource sites, as well as enhance Native Californian cultural resources in the project area. Two historic resources will require additional consultation, evaluation, and mitigation that falls outside of the framework of the PA.

Two cultural resources may be adversely affected by alternative 2, and therefore, cannot be addressed under the PA. In order to address the adverse effects to these resources, the SNF will follow regulatory guidelines found in 36 CFR 800.4-6. The California SHPO has been consulted and concurred with my decision to enter into MOAs to address the potential for adverse effects from specific activities approved in the project and to complete remaining evaluations of eligibility for the NRHP before implementing portions of this decision.

The NHPA provides comprehensive direction to Federal agencies to identify, evaluate, treat, protect, and manage historic properties. The NHPA expands the NRHP and it establishes the ACHP and SHPOs. Section 106 of the NHPA directs all Federal agencies to take into account effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register. The ACHP's regulations (36 CFR §800) implement Section 106 of the NHPA. Section 110 of the Act sets inventory, nomination, protection, and preservation responsibilities for federally owned and administered historic properties.

Administrative Review and Appeal Opportunities

This decision is subject to appeal pursuant to 36 CFR 215. In accordance with the April 24, 2006 order issued by the U. S. District Court for the Missoula Division of the District of Montana in Case No. CV 03-119-M-DWM, only those individuals and organizations who provided comments during the comment period are eligible to appeal [36 CFR 215.11(a), 1993 version].

Appeals must be filed within 45 days from the publication date of the legal notice in the *Fresno Bee*. Notices of appeal must meet the specific content requirements of 36 CFR 215.14. An appeal, including attachments, must be filed (regular mail, fax, e-mail, hand-delivery, express delivery, or messenger service) with the appropriate Appeal Deciding Officer [36 CFR 215.8] within 45 days following the publication date of the legal notice. The publication date of the legal notice is the exclusive means for calculating the time period to file an appeal [36 CFR 215.15 (a)]. Those wishing to appeal should not rely upon dates or timeframe information provided by any other source.

Appeals must be submitted to Regional Forester, USDA Forest Service, 1323 Club Drive, Vallejo, CA 94592, (707) 562-8737. Appeals may be submitted by FAX [(707) 562-9091] or by hand-delivery to the Regional Office, at the address shown above, during normal business hours (Monday-Friday 8:00am to 4:00pm). Electronic appeals, in acceptable [plain text (.txt), rich text (.rtf) or Word (.doc)] formats, may be submitted to appeals-pacificsouthwest-regional-office@fs.fed.us with Subject: Whisky Ridge Ecological Restoration Project.

For electronically mailed appeals, the sender should normally receive an automated electronic acknowledgment from the agency as confirmation of receipt. If the sender does not receive an automated acknowledgment of the receipt of the appeal, it is the sender's responsibility to ensure timely receipt by other means [36 CFR 215.6(a)(4)(iii)].

Implementation Date

If no appeals are filed within the 45 day appeal period, implementation of the decision may occur on, but not before, 5 business days from the close of the appeal filing period. When appeals are filed, implementation may occur on, but not before, the 15th business day following the date of the last appeal disposition.

Contacts

For additional information concerning this Record of Decision, the Final Environmental Impact Statement, or the appeal process please contact:

Aimee Smith, Range Management Specialist and Project Lead
asmith03@fs.fed.us
(559) 877-2218 ext. 3151
57003 Road 225, North Fork, CA 93643

DEAN A. GOULD

Forest Supervisor Date

Appendix A – Whisky Ridge Ecological Restoration Project Selected Alternative Maps

(inserted as a separate file)

Appendix B – Aquatic and Meadow Restoration

The meadow and riparian areas approved for restoration are listed by number/name in table 2.

Aquatic wildlife habitat enhancement- Will be completed by installing culverts on roads 7S068 and 7S076 will be reconstructed to reduce sediment. Eleven meadows within the project area are selected for restoration.

Meadow restoration (physical stabilization) -This will be completed by the installation of bioengineered log fabric step-falls, which will use locally native vegetation (e.g., logs, sod, Willow, sedges, rushes, etc.) to construct the erosion control and stabilization structures. The logs used for these stabilization structures will come from encroaching conifers removed from within the meadow (up to 12 inch dbh) or understory trees around the periphery of the meadow (up to 10 inch dbh). All tree removal will be done by hand and hand log carriers will be used to move the logs to the restoration sites. In some cases equipment or supplies may be shuttled into the work areas using power wheelbarrows, and since there is a potential for ground disturbance, slash (from the vegetation treatments) and/or ply wood, will be placed along the ingress-egress routes to mitigate these impacts.

Meadow restoration (conifer encroachment removal) – This will be completed by hand thinning trees up to 12 inch dbh and removed from seven meadows to reduce conifer encroachment and help reduce the depletion of ground water. Select cedar and/or fir trees within the project meadows (>12 inch dbh) may be girdled for snag creation if the area is deemed snag deficient. Conifers will be hand thinned within each meadow. Trees less than 6-feet tall will be lopped, scattered and left in place; trees greater than 6-feet tall will be bucked in place and the slash left to dry for a minimum of six weeks and then piled and burned. If applicable, 4 inch to 10 inch dbh trees will be cut into 8-foot to 14-foot lengths and moved by hand with log carriers to the edge of the meadow where they will be cached for later use in restoration structures. If no conifers are to be used for restoration purposes, they will be (depending on size) lopped and scattered, bucked in place, or bucked and moved to the meadow edge.

Meadow restoration (mechanical and hand thinning in Riparian Management Area (RMA) – This will be completed by mechanical, hand thinning and piling, and prescribed fire. Mechanical and hand thinning will occur within a 100 foot RMA around selected meadows adjacent to areas proposed for structural restoration (units) to help reduce the depletion of ground water and further address the issue of conifer encroachment. Mechanical thinning will occur where treatment units are proposed, adjacent to the meadow RMA, in the outer 50’ and as far as the equipment can reach within the inner 50 feet of the RMA (approximately 0-35 feet of the buffer from the meadow edge will be hand thinned where mechanical equipment cannot reach). Slash will have a similar treatment in the RMA, as in the adjacent fuel treatment unit, prior to burning. Areas within the meadow RMA where hand thinning is conducted will be hand piled and burn where prescribed fire is proposed. Proposed treatments in the meadow RMA will follow Wildlife-Silvicultural Prescription (Rx). Mechanical equipment will be utilized to thin conifers within the RMA and only where slope gradients are less than 15 percent. Mechanical equipment will not be allowed to turn in the meadow buffer and ingress and egress of mechanical equipment will be on the same path within the meadow buffer. Any soil disturbance will be repaired by hand if necessary. Conifers less than 12 inch dbh will be mechanically thinned within 50 feet of the meadow boundary where mechanical equipment could reach without driving into the inner 50 feet of the meadow boundary. Conifers greater than 12 inch diameter located within 50 feet of aspen will be hand thinned using stand treatment Wildlife-Silvicultural Rx and the boles and limbs will be lopped and scattered and slash will be jack pot burned.

Meadow restoration (off-site livestock water development) - This will be completed by installing four off-site (e.g. located outside riparian area) livestock drinking water developments for cattle adjacent to the following meadows within the Haskell Grazing Allotment within the portion of the allotment located within Whisky Ridge project area: Beehive Meadow (504M153), Benedict Meadow (504M19), China Meadow (504M41), and Peckinpah Meadow (504M29) (Map 12, table 3). Spring and/or channel sources of water (identified specifically within each meadow) will be developed with a spring box to collect water and will be plumbed to distribute the water to a permanently located water trough (e.g. 235 gallon capacity). The diversion of water for the four off-site livestock water developments will require submittal of a Statement of Water Diversion and Use to the State Water Resources Control Board. The implementation of these water developments will be coordinated with Forest Service specialists and will be installed in association with proposed meadow restoration activities to minimize trampling impacts to sensitive riparian areas.

Table 2. Summary of Meadows/Riparian Restoration Actions

Meadow Number/Name	Identified in Conifer Encroachment Study?	Acres of Encroachment	Acres of Thinning in Meadow Buffer Treatment (0-100 feet from meadow boundary)	Acres of Physical/ Structural Meadow Stabilization	Acres of enhancement Rawson's flaming trumpet habitat?	Off-Site Livestock Water Development Proposed?
504M15	Yes	.82	7.2	0.0	0.0	No
504M19/ Benedict Meadow	Yes	.56	8.6	0.0	0.1	Yes
504M28	No	ND	3.0	1.0	0.0	No
504M29/ Peckinpah Meadow	Yes	1.27	12.5	0.0	0.1	Yes
504M37	Yes	.37	.9	0.0	0.1	No
504M41/ China Meadow	No	ND	7.8	1.5	0.1	Yes
504M59	Yes	ND	5.9	3.0	0.1	No
504M60	No	ND	6.5	3.75	0.0	No
504M153/ Beehive Meadow	Yes	1.73	7.4	2.65	0.0	Yes
504M167	Yes	.77	7.1	0.0	0.0	No
504M312	No	ND	5.5	4.0	0.1	No
	Totals	**6**	**72**	**16**	**0.6**	**4**

*Acres are approximate.

Activities Common to all Meadow Restoration Sites:

- Wildlife and botanical surveys will be conducted prior to any restoration activity to ensure protection of those resources and compliance with all relevant BMP's.

- To ensure ample perching/foraging posts for great gray owls within meadows proposed for restoration, the terrestrial biologist will survey areas where encroaching conifers are intended for removal, prior to project implementation and may require retention of several young trees per meadow acre. Additional conifers with associated shrubs such as azalea and western blueberry growing at the base of the bole may also be flagged for retention to provide nesting habitat for migratory song birds throughout the meadow.
- In all cases, native vegetation (e.g., sod) removed during restoration activities will be saved and preserved for later planting. These areas will also be planted with native Willows to expedite and enhance the stabilization process. Willows will be harvested locally from the same meadow(s) or meadows in the same watershed and at the same elevation range.
- Water will be dammed and diverted around the restoration areas during construction. This will be done either by pumping the water using a portable fire pump or by gravity draining impounded water using a 10inches flexible corrugated pipe. Diverted water will be put back into the channel at the bottom of the meadow.
- A watering system will be devised to ensure that newly re-vegetated areas become established as soon as possible.
- If rock is used in the restoration structures, it will come from local forest stock piles, if necessary measures will be taken to avoid moving noxious weeds from the rock source to the meadows. Currently, rock comes from the tunnel talus at Powerhouse 8 off Forest Road 8S03.
- All heavy equipment (if used) will be washed before and after each project to prevent spread of noxious weeds and pathogens such as chytrid fungus.
- Refueling of equipment will follow SNFPA-RCO#1-99, which requires that storage of fuel and refueling occur at least 100 feet from any riparian area and a spill kit will be required on site during implementation).
- Ingress by equipment will occur only when soil moisture conditions are low and the ground firm. If equipment does need to enter the meadow, it will only travel and work where the soil is relatively dry, and in all cases, ¾inch plywood and/or ½inch polyethylene tread mats will be laid down along the equipment route in order to distribute the load more uniformly over the meadow surface and mitigate any tread damage that may occur.
- Any ingress routes enlarged and/or created for equipment to access the meadow(s) will be obliterated upon completion of the project or properly closed if access to the project area is required for maintenance within the first five years after completion.

Appendix C National Forest System Roads and Unauthorized OHV Routes

This appendix addresses road maintenance, temporary road construction, reconstruction, decommission/obliteration and unauthorized OHV route restoration. Table 3 lists the roads that are approved for maintenance and construction treatment in this decision.

Forest Service Road 8S26D - Forest Service Road 8S26D is causing severe erosional impacts and sediment delivery to headwaters of Peckinpah Creek and will be decommissioned and obliterated from a point approximately 0.2 miles from the junction with Forest Service Road 8S26 to Forest Service Road 8S09. To mitigate the loss of access, a re-route will be constructed from the segment of Forest Service Road 8S26D left in place to the 8S26C spur. A 200-foot section Forest Service Road 8S26 running through the west side of Peckinpah Meadow will be reconstructed using a more permeable vented road base or the installation of a series of culverts of sufficient size (18 inches to 24 inches) and number (3 to 5) to accommodate the flow moving across this part of the meadow.

Road 7S34 and Meadow 504M60 - The stream crossing at Forest Service Road 7S34 and Meadow 504M60 will have a 36 inches to 48 inches bottomless arch culvert installed to accommodate runoff and prevent further degradation of the channel banks. Two un-engineered drain points which are hydrologically connected to the meadow will be either relocated with rolling dips or water bars to channel water back onto the forest floor and away from the meadow or any nearby creeks or the drain points will be armored with Media Luna rip rap dissipation structures at their outlets to disperse water back into overland flow. Forest Service Road 7S34 (where it crosses at the head of a small meadow) will be rebuilt with a crushed rock low water crossing to accommodate the high soil moisture and runoff. Other improvements and maintenance on roads) within the project include the installation of culverts, rolling dips, waterbars; aggregate surfacing where soil erosion is evident; riprap at outlets of culverts, dips, and waterbars where needed; minor clearing and widening to a twelve-foot road width for equipment access; aggregate placement on steep slopes, especially in streamside management zones; and replacement of damaged or missing road signs. Best Management Practices (BMPs) developed for road maintenance and reconstruction activities will be incorporated into the design of the project and will follow the Sierra National Forest Land Management Plan (SNF-LMP) Standards and Guidelines, as amended.

Forest Service Road 7S08 - A historic rock trestle crossing the headwaters of Whisky Creek failed and collapsed sometime in the past severing through-access on Forest Service Road 7S08 between Forest Service Road 8S09 to the west and 8S70 to the southeast. Although standard vehicles cannot cross at this point, OHV's can negotiate the steep (>50%) embankments into and across the creek. OHV ingress into the creek has denuded the embankments of all vegetation causing severe slope instabilities and accelerated erosion. Excessive sedimentation (aggradation) is occurring in the creek due to the adjacent hill slope erosion as well as direct impacts to the channel banks from OHV tread damage. Aggradation in this part of the stream channel is increasing the width-to-depth ratio (i.e., over-widening the channel), which is causing increased near bank shear stress and an increase in bank erosion rates beyond the range of natural variability. The erosion and increased sediment input is directly and adversely affecting the aquatic function (e.g. pool habitat) at and downstream of this location. In order to improve and restore degraded aquatic features (e.g., meadows, streams, and riparian areas) several restoration solutions are included in this decision:

- Reclassification of a segment of Forest Service Road 7S08 (from the junction of designated OHV trail 23E283 to designated OHV trail 23E293 (7S08B) to Maintenance Level 1,

- Blockage of approximate 0.5 miles (by gate or other barrier) of 7S08 at the junction of designated OHV trail 23E283 JG5 and the junction of designated trail 23E293 (JSM607S08B) to prevent public access,
    - Stabilization of embankments by seeding with native vegetation, placement of fine mesh coir erosion control blanket on the slopes, covering the slopes with certified weed-free mulch, and installing jute-straw wattles on-contour every five feet in elevation, and,
    - Stabilization of channel banks by re-vegetating with live Willow staves, Willow revetments and/or Willow brush mattresses as needed.

Table 3. Road Maintenance, Reconstruction and Temporary Road Construction

ROAD				EXISTING				PROJECT						PROPOSED WORK				
Number	Segment	Name	Func Class	Mtc Level	Surface	Width Speed	Closure	Mtc Level	Surface	Width-Speed	Design Vehicle	Critical. Vehicle	Closure	New Const.	Reconst.	Maint.	Dust Abatement	Remarks
			1		2		3		2		4	4	3	5	5	5	6	
4S81	1	Minarets Rd	A	4	P	D-25		4	P	D-25	S	S				6.0		
4S81	2	Minarets Rd	A	4	P	D-25		4	P	D-25	S	S				7.5		
7S02	3	Rock Creek	C	2	N	12-5	G	3	N	12-5	T	L	G			0.9	W	
7S02I	1	Rock Creek I	L	2	N	12-5	E	3	N	12-5	T	L	E			0.4	W	
7S02K	1	Rock Creek K	L	2	N	12-5	E	3	N	12-5	T	L	E			1.0	W	
7S04	1	Browns Mdw	L	2	N	12-5	E	3	N	12-5	T	L	E		1.5	1.5	W	
7S07	3	Fish Creek	C	2	N	12-5	G	3	N	12-5	T	L	G			2.3	W	
7S07	4	Fish Creek	C	2	N	12-5	G	3	N	12-5	T	L	G			2.8	W	
7S07B	1	Fish Creek B	L	2	N	12-5	E	3	N	12-5	T	L	E		1.2	1.2	W	
7S07E	1	Fish Creek E	L	2	N	12-5	E	3	N	12-5	T	L	E			0.3	W	
7S07F	1	Fish Creek F	L	2	N	12-5	E	3	N	12-5	T	L	E			1.4	W	
7S07I	1	Fish Creek I	L	2	N	12-5	E	3	N	12-5	T	L	E			0.3	W	
7S07J	1	Fish Creek J	L	2	N	12-5	E	3	N	12-5	T	L	E		0.4	0.4	W	
7S07L	1	Fish Creek L	L	2	N	12-5	E	3	N	12-5	T	L	E			0.5	W	

1) A Arterial
C Collector
L Local

2) N Native
A Aggregate
E Spot Rock
P Pavement

3) B Barrier
G Gate
E Gate Elsewhere
S Sign
N Snow>6”

4) L Lowboy
T Log Truck
Y Yarder
S Sedan
E Engine

5) Show to nearest 0.1 mile

6) W Water
L Lignin
O Oil
S Salts

ROAD				EXISTING				PROJECT						PROPOSED WORK				
Number	Segment	Name	Func Class	Mtc Level	Surface	Width Speed	Closure	Mtc Level	Surface	Width-Speed	Design Vehicle	Critical. Vehicle	Closure	New Const.	Reconst.	Maint.	Dust Abatement	Remarks
			1		2		3		2		4	4	3	5	5	5	6	
7S08	1	Nine Line	L	2	N	12-5	E	3	N	12-5	T	L	E			1.0	W	
7S34	1	Whisky Ridge	L	2	N	12-5	E	3	N	12-5	T	L	E			3.0	W	
7S37	1	Owl	L	2	N	12-5	E	3	N	12-5	T	L	E		1.0	1.0	W	
7S43Y	1	Whisky Falls CG	L	2	N	12-5	E	3	N	12-5	T	L	E			0.1	W	
7S68	1	Pierce Mill	L	2	N	12-5	E	3	N	12-5	T	L	E		3.1	3.1	W	
7S68A	1	Pierce Mill A	L	1	N	12-5	E	3	N	12-5	T	L	E		0.2	0.2	W	
7S76	1	Ellis Meadow	L	2	N	12-5	E	3	N	12-5	T	L	E			2.3	W	
7S76A	1	Ellis Mdw A	L	2	N	12-5	E	3	N	12-5	T	L	E		0.1	0.1	W	
7S94	1	Seven Rocks	L	2	N	12-5	E	3	N	12-5	T	L	E		4.5	4.5	W	
7S94A	1	Powder Can	L	2	N	12-5	E	3	N	12-5	T	L	E			1.7	W	
7S94B	1	Edge Spur	L	2	N	12-5	E	3	N	12-5	T	L	E			0.3	W	
7S96Y	1	Whites Cabin	L	2	N	12-5	E	3	N	12-5	T	L	E			0.9	W	
7S96YA	1	Whites Cabin A	L	2	N	12-5	E	3	N	12-5	T	L	E			0.3	W	
7S96YB	1	Whites Cabin B	L	2	N	12-5	E	3	N	12-5	T	L	E			0.1	W	
7S96YD	1	Whites Cabin D	L	2	N	12-5	E	3	N	12-5	T	L	E			0.2	W	
7S507	1	Coder	L	2	N	12-5	E	3	N	12-5	T	L	E		0.8	0.8	W	

1) A Arterial
C Collector
L Local

2) N Native
A Aggregate
E Spot Rock
P Pavement

3) B Barrier
G Gate
E Gate Elsewhere
S Sign

4) L Lowboy
T Log Truck
Y Yarder
S Sedan
E Engine

5) Show to nearest 0.1 mile

6) W Water
L Lignin
O Oil
S Salts

Table 4 and Table 5 display road maintenance and reconstruction that is incorporated into this decision. Table 6 displays the OHV routes on which site productivity will be restored.

Approximately 29 miles native surface roads were surveyed and evaluated for degree of hydrologic connectivity and stream crossing bypass potential between the road network and the drainage network. Table 4 shows the key problem areas by road, identifies the problem and includes repair solution for both hydrologic connectivity and stream crossing bypass potential that are approved in this decision. Many, if not all, of the hydrologic connectivity and stream crossing bypass problems will be eliminated with proper road maintenance, upgrades to maintenance standards and/or the installation and/or relocation of rolling dips and/or water-bars.

Table 4. Hydrologically Connected Drain Points Along Native Surface Level 2 Roads in the Whisky Ridge project area

Road Name	Drainage Structure	Discharge to	Nature of Problem	Suggested Fix	UTM 11 N Locations Easting/Northing	
7S34	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284902	4131387
7S34	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284902	4131389
7S34	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284821	4131412
7S34	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284949	4131419
7S34	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284715	4131446
7S34	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284224	4131181
7S34	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284680	4131455
7S34	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	285944	4131131
7S34	Osd	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of Osd.	285968	4131138
7S34	Waterbar	Meadow	Excess Sediment Transport	Relocate Waterbar	286191	4131216
7S34	Non-	Meadow	Excess	Install rolling dip(s) and/or	286405	4131291

Road Name	Drainage Structure	Discharge to	Nature of Problem	Suggested Fix	UTM 11 N Locations Easting/Northing	
	Engineered		Sediment Transport	water bar(s) upslope of drain point		
7S68	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281870	4131029
7S68	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282130	4131688
7S76	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284544	4126162
7S76	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284414	4126309
7S76	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284619	4126601
7S76	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284873	4127310
7S76	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284923	4127693
7S76	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	284932	4127765
7S76	Rolling Dip	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	284934	4127813
7S83E	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	280513	4133498
7S83E	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	280508	4133526
7S83E	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	280495	4133551
7S94	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	281390	4131288
7S94	Osd	Stream	Excess Sediment	Install rolling dip(s) and/or water bar(s) upslope of drain	281103	4131458

Road Name	Drainage Structure	Discharge to	Nature of Problem	Suggested Fix	UTM 11 N Locations Easting/Northing	
			Transport	point		
7S94	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281400	4131255
7S94	Osd	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281044	4130494
7S94	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	280497	4131476
7S94	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	280556	4131583
7S94B	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	280957	4128451
7S94B	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	280991	4128379
7S96	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281977	4127647
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282073	4127736
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282116	4127799
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282136	4127823
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282157	4127843
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282167	4127871
7S96	Waterbar	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	282185	4127895
7S96	Waterbar	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	282220	4127921

Road Name	Drainage Structure	Discharge to	Nature of Problem	Suggested Fix	UTM 11 N Locations Easting/Northing	
7S96	Waterbar	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	282245	4127937
7S96YC	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	282796	4128675
8S26	Rolling Dip	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	281787	4127992
8S26	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	281812	4128048
8S26	Waterbar	Stream	Waterbar Eroded	Install rolling dip(s) and/or water bar(s) upslope of drain point	281824	4128068
8S26	Non-Engineered	Meadow	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281619	4127348
8S26	Non-Engineered	Meadow	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	281583	4127254
8S26	Osd	Stream	Needs Osd	Install rolling dip(s) and/or water bar(s) upslope of drain point	281836	4128069
8S26	Non-Engineered	Stream	Excess Sediment Transport	Install rolling dip(s) and/or water bar(s) upslope of drain point	281656	4127453
8s65	Non-Engineered	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	283332	4127669
6S065B	Non-Engineered	Gully	Fill-bank Slump	Raise Road Bed	283300	4127639
7S002	Other	Stream	Excess Runoff to Stream	Install rolling dip(s) and/or water bar(s) upslope of drain point	283812	4134476
7S002	Rolling Dip	Stream	Excess Runoff to Stream	Install Waterbar	283794	4134494
7S002	Rolling Dip	Stream	Stream Impacts	Clean Ditch	283789	4134502
7S007	Non-Engineered	Stream	Meadow Impacts	Install Osd Cattle Presence	284356	4123831
7S007	Rolling Dip	Stream	None	Rolling Dip Good Condition	284373	4123831

Road Name	Drainage Structure	Discharge to	Nature of Problem	Suggested Fix	UTM 11 N Locations Easting/Northing	
7S007	Non-Engineered	Stream	Meadow Impacts	Install Osd Cattle Presence	284364	4123834
7S007	Rolling Dip	Stream	None	Rolling Dip Good Condition	284523	4124772
7S007	Non-Engineered	Stream	Stream Impacts	Install Osd	284508	4124801
7S007	Osd	Stream	Other	Repair Osd	283386	4126527
8S065A	Non-Engineered	Meadow	Meadow Impacts	Install Water Bar Before Meadow	283215	4127700
8S065B	Non-Engineered	Stream	Stream Impacts	Install Water Bar Before stream	283327	4127667
8S065B	Non-Engineered	Meadow	Meadow Impacts	Install Water Bar Before Meadow	283372	4127691
8S070	Rolling Dip	Gully	Stream Impacts	Repair Rolling Dip	284584	4128320
8S070	Other	Meadow	Meadow Impacts	Clean Ditch Install Multiple Cross Drains	283833	4128605
8S070	Non-Engineered	Meadow	Meadow Impacts	Clean Ditch Install Multiple Cross Drains	283834	4128654
8S070	Rolling Dip	Gully	Stream Impacts	Repair Rolling Dip	283830	4128908
8S070	Non-Engineered	Stream	Fill-bank Slump	Install Osd	283645	4129483
8S070	Waterbar	Gully	Gullying	Repair Water Bar	285413	4128340

"Non-Engineered" refers to drainage points where water is flowing off the road at random points where there is no structure to channel the water off the road. "Osd" refers to an Over-side Drain, which is typically a galvanized metal gutter built into the downslope side of the road prism.

Table 5. Selected Alternative Culvert Installment and Maintenance

Road Name	Culvert Condition	Suggested Fix	UTM 11 N Locations Easting/Northing	
8S070	1/4 Plugged	Replace With Longer Culvert Clean Ditch	283834	4128654
8S070	Clear	Possible Flow/Piping Under Culvert	283834	4128884
8S070	Na	Install Culvert	284986	4128155
7S002	3/4 Plugged	Clean Culvert and In-board Ditch	283800	4134484
7S007L	Fully Plugged	Inlet Buried	283453	4126904
8S065B	Na	Install Culvert(S) and Add Aggregate	283337	4127669

Road Name	Culvert Condition	Suggested Fix	UTM 11 N Locations Easting/Northing	
8S070	1/2 Plugged	Clean Culvert	283728	4128348
7S94	1/2 Plugged	Clean Culvert	280560	4131594
7S02	1/2 Plugged	Clean Culvert	283310	4134730
7S76	1/2 Plugged	Large Headcut Upstream Of Culvert. Stabilize headcut and clean culvert.	284540	4126158
7S76	1/2 Plugged	Excess Sediment In Channel Downstream	284759	4126909
7S76	1/2 Plugged	Clean Culvert	284869	4127321
7S94	1/4 Plugged	Bypass Potential due to under-sized culvert. Clean or up size culvert to 24”	280816	4131443
7S76	1/4 Plugged	Clean Culvert	284410	4126315
7S96	3/4 Plugged	Clean Culvert	281687	4127531
7S68	3/4 Plugged	Plugged Culvert Diverts Water Across Road And Gullies Down Fill Slope. Clean or Replace Culvert.	281886	4130981
7S96YC	Crushed	Replace with 24” Culvert.	282798	4128675
7S08	Fully Plugged	Small Wooden (“Historic”) Box Culvert. Needs to be replaced with a modern CMP Steel 24”-36” Culvert	283548	4131013
8S26	Fully Plugged	Clean or Replace Culvert	281835	4128081

Table 6. Selected Alternative OHV Routes To Be Restored

Route Type	Route ID	Miles
Tread width of 50 Inches	AE-19z	0.056
	BP117	0.073
	BP143	0.229
	JG6z	0.045
	JG65	0.036
	JG91	0.076
	JM-7z	0.034
Tread width of 24 - 50 Inches	BP47	0.686
	BP140	0.334
	JG7z	0.071
	JG8z	0.097
	JG42	0.023
	JG48	0.280
	JG60	0.262
	JG142	0.085
	JG144	0.112
	JG147	0.128
	JM-5z	0.031
	JM-8z	0.096
	JSM3	0.130
	JSM55	0.424
	JSM66	0.441
	JSM69	0.077
Tread width of 24 Inches	JG4	0.064
	JG6	0.026
	JG12	0.794
	JG64	0.284
	JM-17	0.502
	JSM62	1.515
Undefined tread width	PUB-08	0.520
	PUB-13	0.598
	PUB-15	0.242
	PUB-16	0.209
	PUB-17	0.231

Appendix D – Alternative 2 Treatment Design and Design Criteria

Treatment Design

The following narrative provides additional detail on treatments relative to meeting project goals:

Maintain or improve growth and vigor of pine, mixed conifer, and fir stands, as well as conifer plantations through density management to increase resiliency by beginning the process of returning treatment areas to conditions more closely resembling those present prior to the early 1900s. A key purpose of the project is to enhance heterogeneity in forest stand structure at both the stand and landscape scale. This goal will be accomplished using a combination of precommercial (less than 10 inches dbh) and commercial (10 inches to less than 30 inches dbh) thinning of conifers utilizing mechanized equipment and hand thinning, dozer piling and prescribed burning treatments. Vegetation treatments will include commercially thinning-from-below pine, mixed conifer and fir stands. Understory vegetation will be precommercially thinned where needed.

Precommercially thin by hand or masticate densely stocked conifer aggregations/stands and release from brush competition will be conducted in the treatment areas. Thinning will reduce stand densities mainly within the lower and mid-canopy levels of the treated stands. Thinning treatments will increase the percentage and perpetuation of shade intolerant pines and oaks by reducing the number of competing incense cedar and fir.

Prescriptions for treatment areas will follow the principles outlined in the PSW-GTR-220 (North, et al. 2009) and PSW-GTR-237 (North, ed., 2012) including the removal of overrepresented shade-tolerant conifers mainly in the lower and mid-level canopy to provide discontinuity in fuels along both the horizontal and vertical fuel profile and increasing forest resilience. Stand densities will be varied based on aggregation of species composition and natural site conditions. Thinning will move stand structures towards the ecological restoration goals of restoring stand structures more consistent with that present prior to the 1900s. The treatment prescriptions are covered in the Chapter 3, Forest Vegetation/Silviculture section. Slash concentrations within commercially and precommercially thinned stands will be treated with a combination of tractor or hand piling and burning or mastication.

Allow for the reintroduction of fire as a process restoration tool. This goal will be accomplished by jackpot (spot), understory, broadcast, and/or pile burning to reduce natural and remaining activity-generated fuels. In some treatment areas prescribed fire will be the only restoration tool used to reduce natural fuels and connect other treatments together across steep or broken terrain that would not be treated with other methods. These treatment areas will generally utilize geographic boundaries (e.g. roads, creeks and meadows) and topographic features (e.g. ridges).

Initiate restoration of key terrestrial wildlife structures and improve wildlife habitat by maintaining and restoring key components that are utilized for shelter, reproduction sites, resting or food sources. Snags, coarse woody debris (CWD), oaks, and large diameter trees are some of the essential habitat components in the Sierra Nevada that are used by a wide variety of vertebrates and invertebrates for shelter, hiding cover, denning, nesting, resting areas and food sources. Approved methods used to restore these habitat components will include precise scattered snag creation by girdling or topping trees, using prescribed fire—including high intensity fire—to create pockets of contiguous snags, and by felling and leaving trees as downed logs to increase availability of CWD. CWD and snag-creating treatments will be implemented under the direction and design of the wildlife biologist and the silviculturist within the Whisky Ridge project treatment areas.

Course Woody Debris (CWD)*:* Where Common Stand Exam (CSE) inventory data shows that CWD is deficit at a landscape scale, trees 16 inch to 26 inch will be cut and left on the ground to increase tons/acre of CWD to desirable levels of 5-20 tons/acre. Approved methods to achieve this desired level of CWD also include recruitment of CWD through prescribed burning treatments that will create some snags, which will eventually contribute to CWD levels.

Oaks: Growth and vigor of oaks will be promoted, where needed, by clearing overtopping conifers.

Snags: Where common stand exam (CSE) inventory data shows a deficit of snags in the larger size classes (>15inch dbh), trees 16 inch to 26 inch will be identified for snag-creating treatments such as girdling and/or topping. Ideally, a mix of species of 4 per acres (S&G #11) will be identified for such treatments including ponderosa pine, incense cedar, sugar pine, and white fir. CSE inventory data will be utilized to determine the relative abundance of each tree species and snag-creating treatments will be implemented according to species abundance within the stand.

High Intensity Fire: A total of 22 prescribed burning units are approved for the Whisky Ridge project. Within the boundary of two of these prescribed burn units (as vegetative and topographic conditions allow), a smaller area of 5-10 acres has been identified for high-severity prescribed fire activity. These high intensity surface burn areas (appendix A, map 2) are located in Unit Rx310 (seven acres), and Unit Rx306 (ten acres). This element was added (in response to comments on the draft EIS) as part of the selected alternative as a means of creating pockets of desirable snags and burned habitat for species such as the black-backed woodpecker that utilize recently burned areas for foraging habitat. This treatment will help contribute greater numbers of snags across the landscape level and create a mosaic of multi-seral stage habitats throughout the Willow Creek watershed. Please note, map 2 uses the term high severity. The intent of the project is to apply high intensity surface fire.

Construct new fuelbreaks and maintain existing fuelbreaks. This goal will be accomplished through thinning, mastication, piling and/or burning.

Treat ladder and crown fuels (live and dead) to modify wildland fire spread and fire intensity levels. This goal will be accomplished by thinning of precommercial and commercial conifers, masticating and/or dozer piling and burning of dead and downed fuels. When needed prescribed fire will be utilized within treatment areas as a tool to reduce natural and activity-generated fuels through pile burning understory and/or broadcast burning. Fuels treatments within the WUI and strategically placed landscape area treatments (SPLATS) will be accomplished to modify intensity and rate of spread of wildland fires near communities and across the landscape.

Integrated weed management will be used to prevent and control infestations of noxious weeds and invasive non-native plants. This goal will be accomplished by hand pulling and/or prescribed burning of noxious weed patches: Prior to or during flowering: bull thistle, Klamath weed, woolly mullein, and any other high-priority noxious weeds that appear in the project area prior to stand and meadow restoration treatments will be treated by non-chemical treatments. This work will continue for at least 5 years, as seeds of these species are present in the soil and the seed bank must be exhausted. Areas infested with noxious weeds where mechanized equipment will be used will be flagged for avoidance to prevent spread of seeds and contaminated soil to clean areas. If burning can be done at the proper time to control noxious weeds, and weeds are present in units planned for burning, weed control will be accomplished through burning in addition to hand-pulling.

Restore production and enhance vitality of culturally gathered plant material through vegetation management activities. This goal will be accomplished by improving vegetation structure with prescribed burning treatments and meadow restoration.

Protect the historic values and characteristics of archaeological and historical cultural resources and improve their integrity by reducing fuels within prehistoric and historic cultural resource sites. This goal will be accomplished by hand thinning and piling, followed with prescribed burning and mechanical treatments. In coordination with the district archaeologist, this decision will treat approximately 100 acres of dead and down fuels and vegetation within cultural resource sites, according to the unit prescriptions.

For prehistoric and historic cultural resources with heavy fuel loading, treatment measures by way of hand thinning brush and understory will utilize chainsaws to thin fuels. Brush will be piled for future burning outside site boundaries in prehistoric sites. Piles can be placed within historic sites, away from features, if there are no wooden components. Pile locations will be determined through coordination with the district archaeologist, and where necessary, hand lines will be constructed around piles to contain fire.

For prehistoric cultural resources with heavy fuel loading, treatment measures by way of low-intensity burning through the cultural resource site may occur. Handlines will be constructed outside site boundaries where necessary to control direction of the fire, and will be done in coordination with the district archaeologist and fuels personnel. Underburning will only occur in cultural resource sites with a potential for a low intensity fire focused on cleaning out the understory.

For prehistoric and historic cultural resources with heavy fuel loading, thinning of forest stands may occur through mechanical treatment. Should identified tree stands within cultural resources need to be thinned in order to meet forest stand health requirements, those trees that can be reached from outside the boundary of a prehistoric site by a feller-buncher will be cut and removed without disturbing the ground. In coordination with the district archaeologist, mechanical equipment may enter an historic site to reach trees to be cut in areas with no observed cultural deposits or features.

Improve aquatic habitat and restore degraded meadow (e.g. meadows, streams, and riparian areas). This goal will be accomplished by reducing encroaching conifers by thinning (within meadow and buffer treatments on meadow periphery), pile and understory burning along meadow edges and stabilizing areas of accelerated erosion with structures where necessary. The selected alternative was designed to improve, enhance or completely restore the hydrologic function of degraded meadow systems such that water storage and residence time is maximized, increasing annual water availability to riparian-aquatic systems, wildlife, and livestock. Restoration of meadows within the project area includes physical repair and stabilization of degraded areas, noxious weeds control (hand pulling), reducing unauthorized route impacts, reducing National Forest System (NFS) roads impacts, and improving livestock distribution through development of off-site water. Please refer to Appendices B, C and E for details related to this portion of the proposal.

Identify, improve, and maintain National Forest System Roads (NFSR) needed for the project and address NFSR identified for potential decommissioning or reconstruction. This goal will be accomplished by installing culverts, water barring, obliterating and rerouting short portion of FS roads. Segments of FS road will be re-classified to Maintenance Level 1. This will be completed by blockage (by gate or other barrier), seeding with native vegetation and erosion control. See appendix C and D for additional information.

Restore to site productivity unauthorized off-highway vehicle (OHV) routes previously identified in the Sierra National Forest Motorized Travel Management Plan (2010). This goal will be accomplished by barricading, sub soiling, water barring, and/or distributing downed logs to decommission routes and/or restore to site productivity (e.g. begin to return to natural conditions). Approved treatments include; 1) barricade and sign both ends of the trail to prevent OHV riders from

using the trail; 2) subsoil the track to de-compact the soils and allow regeneration of native vegetation; 3) construct adequate water bars to prevent surface erosion; and 4) distribute downed trees that are available in the surrounding forest. The OHV routes that will be decommissioned are found in appendix D.

Minimize resource impacts and improve facilities at Whisky Falls Campground. This goal will be accomplished through thinning and hazard tree removal as needed within the campground boundary, installing bear boxes using hand tools and replacing existing vault toilets. Missing or damaged barriers used to restrict vehicle access to prevent resource impacts will be replaced at each of the nine campsites. Bear boxes will be installed at each of the nine campsites using hand tools. A pad approximately 4 inches to 8 inches in depth by 2 feet wide and 6 feet in length will be dug at each location to level the surface for a permanent concrete pad where the bear boxes will rest. This decision includes the decommissioning of the current wooden two seat vault toilet and replacement, at the existing toilet location, with a new Sweet Smelling Toilet (SST) housing a two seat vault toilet. Minimal clearance of vegetation will be required to accommodate the new vault toilet foundation which will cover approximately 6 feet x 11 feet square feet. About 2,640 linear feet of wooden parking barriers in their existing locations will be replaced to prevent unauthorized vehicle use from degrading campsites and to create designated parking areas. This decision allows for vegetation treatments within the Whisky Falls Campground to meet density management and public safety objectives through thinning and hazard tree removal as needed.

Manage scenery for the highest quality in areas significant to recreation and as seen from key viewing points from which the public views the landscape and are most sensitive to visual change. This goal will be accomplished through piling, burning and stump cutting in areas that detract from valued scenic areas significant to recreation key viewing points (e.g., burn piles, landings, fuelbreaks, temporary roads, and cut stumps). This decision allows for treating areas to minimize ecosystem stressors (e.g., wildland fire, insect outbreaks), and dense vegetative conditions (e.g., excessively dense and even-aged stands) that will detract from the valued scenic character by implementing LRMP Standards and Guidelines (scenic integrity and scenic stability).

Design Criteria

The design criteria listed below are included in and are an integral part of the selected alternative. They direct the design of treatment areas and treatment types and must be followed during implementation. They were considered when analyzing the direct, indirect and cumulative effects of the selected alternative and have been incorporated to minimize potential environmental impacts of the management actions. As listed, they are a subset of the management direction provided in the Sierra NF Forest Plan (USDA 1992) as amended by the 2004 SNFPA ROD (USDA 2004b), the 2007 Sierra NF MIS plan amendment (which added standard and guidelines (S&G)), Forest Service Manuals and Handbooks; and best management practices. The design criteria are also based on past implementation experience; the best available science and/or to address significant issues. Also see the best management practices (Appendix F) that are incorporated into this decision.

Air Quality

The following are Best Available Control Measures (BACMs) for prescribed fire as required under Section 190 of the Clean Air Act, as amended in 1990 and mechanical treatments. The U.S. Environmental Protection Agency developed implementation strategies and BACMs for areas that are designated serious non-attainment for criteria pollutants. Specific techniques to reduce emissions include the following:

1. Employ commonly used reduction techniques such as burning units after harvest before new live fuels appear; burning in the springtime prior to "green-up," burning when 1,000-hour fuels (woody debris larger than 3 inches in diameter) moistures are high, and burning when the duff is wet (after fall precipitation, or during winter and spring).

2. Employ avoidance techniques such as burning on cloudy days when the plume and residual smoke cannot be seen, burning during periods of atmospheric instability for better smoke dispersal, and burning during periods of low visitor use.

3. Employ techniques to optimize flaming combustion, including burning piled fuels rather than broadcast burning, reducing the amount of soil in piles, and employing rapid ignition to create a high intensity fire.

4. Ensure that all activities conform to the State Implementation Plan (SIP)

5. Conduct a full conformity analysis, as required by the Clean Air Act and the SIP to assess whether the proposed action produces less than *de minimus* emissions.

6. Where possible maximize removal of surface fuels loads by mechanical means such as dozer spot piling prior to understory burning to reduce emissions.

7. Work closely and coordinate with the SJVAPCD to minimize air quality and smoke impacts locally and regionally. Coordinate on air quality related press releases.

8. Mobile and stationary source controls: Reduce use, trips and unnecessary idling from heavy equipment. Maintain and tune engines per manufacturer's specifications to perform at California Air Resources Board and/or EPA certification.

9. Prohibit any tampering with engines and require continuing adherence to manufacturer's recommendations.

10. If practicable, lease new, clean equipment meeting the most stringent of applicable Federal or State standards.

11. Utilize EPA-registered particulate traps and other appropriate controls where suitable to reduce emissions of diesel particulate matter and other pollutants.

12. Administrative controls: Identify all commitments to reduce emissions and incorporate these reductions into the air quality analysis to reflect additional air quality improvements that would result from adopting specific air quality measures.

13. Identify where implementation of mitigation measures is rejected based on economic infeasibility.

14. Prepare an inventory of all equipment prior to work and identify the suitability of add on emission controls for each piece of equipment.

Aquatics Wildlife

In addition to the Forest Service standards and guidelines previously detailed that will be applicable to the Whisky Project. The following design measures will be implemented to aquatic/riparian habitat:

1. Streamside Management Zones (USDA - Forest Service 1992 (S&G 33 and 71); USDA Forest Service 2000 (BMP 1-8)) are mapped in the Project Hydrology Report. Class I SMZs are within or adjacent to treatment areas: H-147, H-501, H-502, H-505, M-402, M-403, M-404, RX-302, RX-305, RX-307, RX-308, RX-311, RX-313, RX-314, RX-317, RX-318, RX-319, RX-321, T-112, T-114, T-121, T-122, T-124, T-126, T-130, T-131, T-132, T-137, T-138, T-141, T-142, T-145, T-149, and T-152. Activities within Class I streams are identified under the Old Forest Linkage Prescription under Terrestrial Wildlife (100 foot zone).
    - No heavy equipment will enter the Class I SMZ (100 feet).
    - Hand treatments of non-merchantable trees could be implemented within the outer 50 feet of the Class I SMZ, although piled material should not be left within 50 feet.
2. Specific to western pond turtle: Class I occupied (USDA - Forest Service 1992 (Forest wide goal and objective 9, S&G 40): Known sites in the aquatic analysis area. Habitat in units M-406, T-100, and T-101 will apply the Old Forage Linkage prescription.
    - Project activities will occur between June 15th and October 1st.
3. Special Aquatic Features (USDA - Forest Service 2004 (S&G 91): Do not allow heavy mechanical equipment within 100 feet of meadows or other special aquatic features, except for meadows identified for restoration (heavy mechanical equipment limited to 50 feet from meadow edge). Includes treatment areas: H-502, M-400, RX-301, RX-303, RX-305, RX-306, RX-307, RX-308, RX-310, RX-311, RX-312, RX-314, RX-316, RX-317, RX-318, RX-319, T-105, T-107, T-108, T-109, T-112, T-113, T-114, T-122, T-124, T-125, T-126, T-133, T-135, T-136, T-137, T-138, T-139, T-140, T-141, T-142, T-143, T-151, T-152, T-153, and T-157.
4. Applicable to all SMZs:
    - To protect bank stability, do not cut stream bank trees (trees with drip line extending to or over edge of stream bank).
    - Do not cut any tree located within a channel.
    - When lighting piles, start burn from one end only to allow escape route for any species inhabiting piles.
    - No prescribed fire lighting into SMZs, but fire can creep into zone.
5. For water drafting (USDA Forest Service 2000 (BMP 2-21), use a screened intake device and pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats. A hydrologist or aquatic biologist would approve water-drafting sites.
6. The following Best management Practices (BMPs) (USDA Forest Service 1983, 2002, 2012) requirements are designed to address the watershed management concerns. All applicable water quality BMP's will be implemented. A list of BMP's used within the Whisky project is as follows (See project Hydrology Report: Stone 2012 for details):

    1.1 Timber Sale Planning Process
    1.2 Timber Harvest Unit Design
    1.4 Use of Sale Area Maps and /or Project Maps for Designating Water Quality Protection Needs
    1.5 Limiting Operating Period of Timber Sale Activities
    1.8, 1.19 Streamside Management Zone Designation, Streamcourse and Aquatic Protection
    1.9 Determining Tractor Loggable Ground

1.10 Tractor Skidding Design
1.12, 1.16 Log Landing Location, Log Landing Erosion Control
1.13, 1.17 Erosion Prevention and Control Measures During Timber Sale Operations, Erosion Control on Skid Trails, and Fuels Treatments
1.18 Meadow Protection During Timber Harvesting
1.20 Erosion Control Structure Maintenance
2.2 General Guidelines for the Location and Design of Roads and Erosion Control Plan
2.3 Timing of Construction Activities
2.5 Road Slope Stabilization Construction Practices
2.7 Control of Road Drainage
2.8 Constraints Related to Pioneer Road Construction
2.11 Control of Sidecast Material During Construction and Maintenance
2.13 Control of Construction and Maintenance Activities Adjacent to SMZ's
6.2 and 6.3 Consideration of Water Quality in Formulating Fire Prescriptions and Protection of Water Quality from Prescribed Burning Effects

Botany

Revegetation and Seeding using Native Plants

Any seeding for erosion control or any other purpose would use locally native plant species approved by the Forest Botanist or the Assistant Forest Botanist as outlined in the Region 5 Native Plant Policy (USDA Forest Service 1994).

Forest Service Sensitive Plants

SNF 1992 LRMP S&G #s 67 and 68, SNFPA 2004 ROD S&G # 125.

1. Flagging for sensitive plant avoidance will be done using white and lime-glo flags tied together.
2. Stretches of stream identified as Essential Habitat for Rawson's flaming trumpet (*Collomia rawsoniana*) (SNF 1992 LRMP, S&G # 33) will have a Riparian Management Area of 150' rather than the usual 100' SMZ where no heavy equipment is permitted (see hydrology design criteria). Essential Habitat includes reaches of Whisky, Gertrude, Owl, Roush, Peckinpah, and Browns creeks (see Botany BA/BE). However, the RMA of 150' may be reduced to 100' by the forest botanist in treatment units where there is no flaming trumpet present in the outer 50'.
3. Any Rawson's flaming trumpet populations outside of SMZs, RMAs, or proposed meadow periphery treatments related to flaming trumpet enhancement and meadow restoration will be flagged for avoidance with a 50' buffer unless a different approach is approved by the forest botanist.
4. In areas where Rawson's flaming trumpet grows at the meadow periphery and mastication treatments are proposed, flaming trumpet will be flagged for avoidance prior to mastication work and the contractor will be made aware of the areas to be avoided.
5. The Kellogg's lewisia (*Lewisia kelloggii*) populations on the open granitic and/or gravelly areas between plantation units 228 and 236 and south of unit 236 will be flagged for avoidance. The gravel and rock areas will not be driven through for project implementation (except on existing system roads) nor used for parking of vehicles, heavy equipment nor used as log landings.

6. Open, rocky / gravelly habitat in RX burn units 306, 307, and 308 will either be surveyed for Kellogg's lewisia and Yosemite lewisia (*L. disepala*) prior to implementation so that any plants present can be flagged for avoidance, or the absence of plants can be documented. If surveys have not been conducted, areas where vehicles used to conduct the prescribed burning can park and drive will be limited to previously disturbed areas to the extent practical to ensure that habitat for these rare plants is not damaged, and dormant plants are not killed by vehicles or equipment.
7. An equipment buffer of 100 feet will be flagged around the population of the extremely rare brook pocket-moss (*Fissidens aphelotaxifolius*) on Owl Creek upstream of Road 7S08 to prevent any disturbance to the stream habitat or any degradation of the surrounding uplands that might affect the stream.
8. Known Forest Service Sensitive plants in meadows and fens to be restored will be flagged for avoidance (e.g. Bolander's bruchia, *Bruchia bolanderi* in China Meadow), other meadows will be surveyed for Forest Service Sensitive mosses and vascular plants prior to commencement of meadow restoration work and any Sensitive Plants would be flagged (USDA FS 2004, S&G 125). The exception will be in areas where trees are being thinned at meadow peripheries to enhance Rawson's flaming trumpet.
9. Road crossings with streams containing the veined water lichen (*Peltigera gowardii)* occurring within 50 feet of the road will not be used for drafting of water (e.g. Browns, Owl, Whisky Creeks).
10. The short leafed hulsea (*Hulsea brevifolia*) occurrence at the south edge of Rx Burn unit 309 along Road 7S02 will be flagged for avoidance. Burning during the dormant period for this plant (fall) will be acceptable but ground disturbance by vehicles and heavy equipment must be avoided.

Noxious Weeds

SNFPA 2004 ROD S&G # 38 and 39; USDA Forest Service FSM 2900, Timber Sale Contract Clause B.6.35.

1. All heavy equipment used for implementing the project will be washed before arriving on site to remove soil and seeds of noxious weeds.
2. Noxious weeds within the parts of the project area proposed for treatments and along access roads will be hand-pulled prior to treatments as time and funding allows; but infestations would be flagged for avoidance whether or not they have been hand-pulled first (to ensure that the contaminated soil is not spread by tires if vehicles or equipment park or drive on infested sites). Flagging will be bright orange with the words "noxious weeds" in black.
3. Any erosion control material used for meadow restoration or road reconstruction must be noxious weed free: Either certified weed free or inspected by the Forest Botanist prior to purchase from a local source (e.g. hay and straw
4. Any fill or gravel material used for road reconstruction or armoring of roads must be free of noxious weed seeds. This may require certification by the forest botanist or another professional knowledgeable about BMPs regarding weed spread via mineral materials (Cal-IPC, 2012)

Cultural Resources

Cultural resources will be protected through implementation of Approved Resource Protection Measures found in the Regional Programmatic Agreement (PA) 2013, the primary protection measure being avoidance for all project activities, including resource design criteria.

The following design criteria are applicable to the Whisky Ridge Ecological Restoration Project:

1. All cultural resource sites within treatment areas and proposed project activities will be delineated prior to implementation.
2. The district archaeologist will approve landings, borrow sources, and temporary roads prior to project implementation, as needed.
3. Harvest activities of potential hazard trees within and immediately surrounding the Whisky Falls Campground will avoid historic campground features and be implemented in accordance with Approved Resource Protection Measures found in the Regional PA 2013.
4. All repairs/replacements to campground, recreation (i.e., trails), and special use facilities, if damaged during project implementation (see design features for Recreation, Lands, Special Uses), will need to be approved by the district archaeologist prior to repair/replacement and may require consultation with the SHPO prior to repair/replacement.
5. The district archaeologist will be consulted for movement of equipment across and repair of designated trails (see design features for Recreation, Lands, Special Uses), prior to project implementation and subsequent repair, and may require consultation with the SHPO prior to implementation.
6. There may be cultural resource sites within or surrounding Watershed Improvement Needs sites. If they are currently eligible or unevaluated for inclusion on the National Register of Historic Places, they must be treated as eligible. To mitigate the potential adverse effect, a determination of eligibility will be conducted for these sites and any adverse effects mitigated prior to project implementation.
7. Treatment of gathering areas, if identified, will be coordinated with the district archaeologist prior to treatment implementation.
8. Road maintenance and reconstruction activities on historic railroad grades converted to FS system roads will be reviewed and approved by the district archaeologist prior to contract preparation and will comply with the following:
    a. Brush disposal piles generated during roadside clearing will not be piled within archaeological sites or within or near features of historical sites;
    b. Equipment will not park or drive on railroad features (e.g., berms, through-cuts) nor turn around outside existing turn-outs on system roads;
    c. No widening of existing road templates;
    d. All blading will remain within existing road prism;
    e. Equipment will not cut into side banks or berms;
    f. Through-cut feature will remain intact and will not be cut off at either end. Bladed material will be pushed past the feature and then off the road;
    g. No placing lead-off ditches through berms, through-cuts, or other features;
    h. When cleaning culverts or drainages, existing headwalls will not be impacted. Drainage structures will be accessed only where there are no existing railroad features;

i. Any existing features that require work will be re-built with in-kind material and design.

Should any adverse effects to the historic railroad system be anticipated, the Sierra NF will follow number 11 below.

9. In addition, where the proposed action is to reduce fuel loading and fuel ladders within prehistoric and historic sites, the cultural resources will not be managed under the above referenced measures. Instead the following design criteria will be followed in order to address the purpose and need, and comply with applicable regulation and policy.
10. For prehistoric and historic cultural sites with heavy fuel loading, treatment measures by way of hand thinning brush and understory will utilize chainsaws to thin fuels. Brush will be piled for future burning outside site boundaries in prehistoric sites. Piles may be placed within historic sites where there are no wooden components and away from features. Pile locations will be delineated through coordination with the district archaeologist and, where necessary, hand lines will be constructed around piles to contain fire.
11. For prehistoric cultural sites with heavy fuel loading, treatment measures by way of low-intensity burning through cultural sites may occur. Handlines will be constructed outside site boundaries where necessary to control direction of the fire. This will be done in coordination with the district archaeologist and fuels personnel. Underburning will only occur in sites with a potential for a low intensity fire focused on cleaning out the understory.
12. For prehistoric and historic cultural sites with heavy fuel loading, thinning of forest stands may occur through mechanical treatment. Should identified tree stands need to be thinned in order to meet forest stand health requirements, those trees that can be reached from the site edge by a feller-buncher will be cut and removed from prehistoric sites without disturbing the ground. Mechanical equipment may enter historic sites to reach trees to be cut in areas with no observed cultural deposits or features in coordination with the district archaeologist.
13. An archaeologist will monitor all fuel reduction activities within and around cultural resource sites during implementation. An archaeological monitoring report will be required for each activity.

Engineering/Transportation

1. Perform road maintenance, reconstruction, and new road construction activities to support project access needs in accordance with the standards and guidelines established in the forest plan, Forest Service Handbook 7709 and 6709, as well as the Bass Lake Ranger District Hazard Tree guidance (BLRD Hazard Tree EA 2006).

2. Maintain all National Forest System roads to standards established in the forest plan. Insure drainage structures are functional and stable to prevent potential resource damage and degradation of water quality (S&G #78, #79, #124, #206 and BMP's). This will be accomplished through road reconstruction activities and project road maintenance plans.

3. Perform a final field review of project roads to determine reconstruction needs prior to project activities. Where economically feasible, place aggregate on existing native surface roads located in areas with high and very high soil erosion hazard ratings (S&G #129). Field reviews will be scheduled with the hydrologist, archeologist and timber management officer.

4. Close all temporary roads required for unit access upon completion of use; remove all culverts, rip and ditch landings, construct waterbars, block the entrance with a log and dirt berm, and disguise the entrance with brush to discourage additional traffic.

5. Roadways will be managed for safe passage by road users. This will include the management of hazards associated with roadside vegetation, including the identification and mitigation of danger (hazard) trees. A danger tree, as defined in Forest Service Handbook (FSH) 7709.59, Chapter 40, is a standing tree (live or dead) that presents a hazard to people due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stem, or limbs and the direction of lean of the tree (FSH 6709.11, Glossary). Selection criteria guidelines for the marking and removal of danger trees will be tiered to the BLRD Hazard Tree Environmental Assessment, (USDA 2006a).

6. Water may be available for dust abatement during project activities; however, water will not be drafted from creeks if the stream flow is less than 1.5 cubic feet per second. Other methods of dust abatement such as trip restrictions, speed reductions, or approved dust oil will be considered as an alternative to using water. Disposal of clearing slash will be by pile and burn or chipping. Stumps may be treated by scattering beyond the toe-of-fill and below the road surface. When feasible, roads will be out sloped to reduce concentrations of water and soil erosion.

Fire and Fuels

Design Features and Mitigation Measures

SNFPA ROD (USDA 2004b) S&G #1, 2, 3, 4, and 5 addresses fuels treatments. S&G #1, 2, 3, 4, and 5 implementation criteria include:

The utilization of prescribed fire to maintain appropriate levels of surface and ladder fuels to meet fire and fuels objectives will be conducted in; RX 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320 and 321 after structural restoration treatments have been completed. RX 300 and 312, portions areas of RX 301, 304, 306, 311, and 313 underburning will be the initial treatment. Other prescribed fire treatment areas and units needed to treat other resource needs are identified in the selected alternative. To reduce the potential impacts (fire effects) that may occur with the implementation of prescribed fire, the following criteria will be considered in the areas where prescribed fire will be used:

1. Prescribed fire areas will be considered where there are larger residual trees (of size less susceptible to fire damage) with light fuel loadings, and/or areas where conifer reproduction is not being used for re-generation of openings.

2. Prescribed fire will be conducted as outlined in a burn plan, to minimize effects to trees during active growing period and within Spotted owl, Goshawks, and Pacific fisher denning habitat areas.

3. The best available control measures (BACMs) for prescribed fire will be done as required under Section 190 of the Clean Air Act, as amended in 1990.

4. Prescribed fire will be used during the late fall, winter, late spring or early summer, to minimize effects to trees during active growing period and within Pacific fisher denning habitat areas.

5. Each resource specialty will be involved in review of and finalizing the prescribed burn prescription in the prescribed burn plan to ensure the modeled fire effects will meet their resource objective or will not create conditions that are outside of the guidelines from the SNFPA ROD (USDA 2004b) Standards and Guides.

For the post-harvest slash reduction needs the following criteria will be utilized to reduce and break up continuous concentrations.

1. Following the completion of timber harvest each area will be inspected by field visits to prioritize the need for slash treatments.
2. A plan for any spot piling will be completed after all post-harvest precommercial ladder fuel thinning to minimize extra equipment entries over the landscape.

Treatments will reduce surface fuels, ladder fuels, and some aerial fuels (to meet the purpose and need of reducing stand densities to restore forest structure and composition towards heterogeneity and biodiversity, and reduce the potential for uncharacteristically severe wildfire). This will occur through the use of mechanical methods as well as management ignited fire in the form of prescribed fires such as pile burning, and understory burning. Prescribed fire will be applied to the project area for three purposes: 1) as a final "cleaning" after vegetation management treatments have been completed to further reduce 1, 10 and 100 hour fuels (those fuels that have the greatest influence on fire spread); 2) to maintain the lower levels of the 1, 10, and 100 hour fuels; and, 3) to reintroduce the fire element back into a fire dependent ecosystem.

The utilization of prescribed fire only as a form of restoration treatment will be conducted in treatment areas identified as "Rx" units (Rx300 thru 321, a total of 21 units). These units will have (as needed) at least two prescribe fire entries within the lifespan of the project. Utilization of prescribed fire after structural restoration treatments have been completed will be conducted within these treatment areas to maintain appropriate levels of surface and ladder fuels to meet fire and fuels objectives. These units may include pile burning, understory burning or a combination of both. To reduce the potential impacts (fire effects) that may occur with the implementation of prescribed fire, the following criteria will be considered in the areas where prescribed fire would be used:

Removal of woody biomass (harvest generated slash from landings and precommercial sized trees) for energy production may (is approved to) be utilized as a potential fuel removal method. If this treatment option becomes available the benefits will be as follows: Reduced costs for piling and burning of fuels, increased burning efficiency at biomass plant will reduce smoke and greenhouse gas emissions such as carbon dioxide ($CO_2^{)}$. The amount of carbon dioide (CO_2) emitted during the burning process is typically 90 percent ess than when burning fossil fuel (USDA Forest Service Wood Products Lab 2004). This method has been analyzed in this report and will have no effects. Table 7 displays the post thinning treatments for removing natural and activity created fuels.

Table 7. Acres of Post thinning Fuels Treatment

	Hand Pile/ Burn Pile	Tractor Pile/ Burn Pile	Understory Burn Only	Mastication Only	Fuelbreak (New Construction /Maintenance)
Selected Alternative	200	2728	2838	520	433 / 601 = 1034 Total

Forest Vegetation/Silviculture

1. When the sap is running (prior to August 1st), fir bark is much more easily dislodged. To minimize damage to the residual stand, extra precautions will be needed during mechanical operations taking place in well stocked stands heavy to fir (over 50 percent) prior to August

1st. The district silviculturist will determine which stands are well stocked and heavy to fir during the thinning layout phase. Sale administration will coordinate with the silviculturist to ensure minimal stand damage.

2. Based on SNFPA ROD (USDA 2004b) S&Gs for mechanical treatments, as well as design criteria, silvicultural prescriptions will be written utilizing thinning from below techniques with basal area levels for stand species composition.

3. To minimize the threat of insect attack, all green pine logs created as a part of harvest operations will be removed from the sale areas as either logs or biomass material within 6 weeks of creation. Unutilized green pine material will not be concentrated but spread to dry quickly or chipped and spread. Green pine logs greater than 3 inches in diameter that are created between June1st and October 30th and left in the stand will not exceed 8 feet in length.

4. Commercial thinning operations taking place before June 1st or after October 30 th in pine stands will require additional measures to minimize creation of pine slash concentrations. Additional bucking of slash may be needed to minimize creation of favorable insect breeding habitat. Any green pine logs greater than 3 inches in diameter created after October 30th or before June 1st left in the stand will not exceed 4 feet in length. Precommercial thinning of pine stands will not take place before July 1st or after October 30th each year. (Schultz 1987)(Flowers 2007)(Murray 2012)

5. Where whole tree yarding is utilized, careful consideration must be given to the protection of the residual trees from damage. Rub trees (previously designated for removal) and/or rub logs will be retained where needed to minimize damage. These will then be removed upon completion of yarding. Skid trails will be as straight as possible and approved prior to skidding. Landing size will be kept to a minimum especially in areas where additional trees must be felled to create landings. To minimize landing size, logs/biomass will be removed as quickly as feasible from landings during skidding operations and not allowed to accumulate.

6. During post-sale treatments, 15 to 20 percent of the understory growth will be retained within plantations and wild stands in pockets approximately 1/10 acre in size. When determining understory pockets to be retained, understory pockets around oaks, groupings of larger diameter trees, steep slopes, draws, etc. within treatment units will be included. Understory pockets will not be retained in locations where they would jeopardize the effectiveness of planned fuels treatments.

7. To minimize damage to the residual stand, such as loss of canopy and hiding cover and reproduction needed to maintain stand structure and down logs, initial underburning in T stands will only be undertaken during the spring when duff and down log moisture content is high and before actively growing trees become susceptible to excessive damage. Where concentrations of existing and/or created slash are present, spot piling may be needed prior to burning. The silviculturist and fuels representative will coordinate underburning areas prior to undertaking underburning.

8. To minimize the potential for regeneration of brush species, masticated brushfields will not be burned unless coordination with the silviculturist has been completed.

9. To minimize damage to the residual stand and loss of plantation financial investment, underburning will be excluded from the following plantations located within approved underburn treatment areas unless the silviculturist determines underburning in a given plantation is acceptable:

- Plantation 236 in Rx309

- Plantation 237 in Rx310
- Plantation 231 in Rx308
- Plantations 224, 225, and 226 in Rx307
- Plantation 223 in Rx306
- Plantation 214 and 216 in Rx304
- Plantations 240, 241, 242 in Rx311
- Plantations 238, 239, 244, 249, 250, 252, and 253 in Rx312
- Plantations 208, 204, 205, 203, 202, and 201 in Rx303
- Plantation 263 in Rx318

10. To minimize damage to the residual stand during slash piling, tractor size will be limited to a D-5 or smaller size tractor.

Geology/Soils

1. Maintain a 100 foot wide buffer of 90 percent soil cover below rock outcrops that have the potential to generate runoff into management activity areas and cause erosion in areas disturbed by mechanical operations. These areas include those mapped out as potential rock outcrop sites and any areas ¼ acre or larger. (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management):

    a. Treatment units with potential rock outcrop greater than 10% of their total area include T100, T101, T105, T107, T108, T112, T113, T118, T119, T123, T125, T127, T134, T138, T139, T140, T143, T146, T148, T149, T150, T152, T153, T156, T157, T158 and T160.

2. Conduct mechanical equipment operations (mechanical thinning and biomass removal equipment, log skidders and tractor-piling operations) when the soil is sufficiently dry in the top 12 inches to prevent unacceptable loss of soil porosity (soil compaction). “Maintain 90% of the soil porosity over 85% of an activity area (stand) found under natural conditions.” (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management)

3. Subsoil and water bar skid roads and trails in areas where soil compaction exceeds 15% of a treatment area. (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management)

    b. 2% of the pre-treatment soil transects showed soil compaction

4. Except for mastication, limit mechanical operations, where sustained slopes exceed 35%, except where supported by on-the-ground interdisciplinary team evaluation. (LRMP S&G 125)

    c. Treatment units with some areas above 35% include T101, T102, T105, T109, T110, T111, T112, T113, T116, T128, T130, T132, T133, T142, T144 and T149.

5. Maintain 50% soil cover over all treatment areas. Where shrub species predominate, attempt crushing prior to piling to create small woody fragments left scattered over the site for soil cover and erosion protection. (LRMP S&G #130)

    d. Pre-treatment average soil cover was at 97%

6. Maintain at least five well-distributed logs per acre as large woody debris (LWD) representing the range of decomposition classes. (SNFPA ROD S&G 10)

e. Pre-treatment average for the project area was 17.10 pieces of LWD per acre

7. Provide for road surface stabilization (gravel) on roads over 5% grade that are located on sensitive soils and are affecting soil productivity and/or water quality. Sensitive soils include; Auberry, Holland and Ultic Haploxeralfs soil families. (SNF- LRMP S&G #129).

   f. Roads located on sensitive soils requiring potential road surface stabilization include 8S27, 8S27B, 8S27C, 8S27D, 8S09 to the junction with 7S07 and 8S09A.

8. Limit tractor piling in those watersheds where CWEs are a concern and use a grapple piler, especially on slopes >25%. (LRMP S&G 120).

   g. Treatment units with a CWE concern in subdrainage 504.1002 include; T112, T113 & T114.

9. Limit mastication treatments to slopes that are 50% or less.

   h. Limit soil displacement and reduce the risk of soil erosion by smoothing or water barring the ruts or trenches, exceeding 6 inches in depth and 25 feet in length on slopes exceeding 35%.

   i. Limit mastication operations to time periods where soils are sufficiently dry to prevent rutting and/or compaction by a single pass of the equipment.

   j. Treatment units with some areas above 35%, include M400, M401, M402, M403, M404 & M406

OHV Route Restoration

Those routes selected for route decommissioning within the Whisky project area will have one or more of the following five design measures/mitigation measures:

1. No action
2. Barricade and sign both ends of the trail to present use.
3. Subsoil the track to de-compact the soil and allow regeneration of native vegetation.
4. Construct adequate water bars to prevent surface erosion.
5. Distribute down trees that are available in surrounding forest on route surface.

Hydrology - Meadows

Design Criteria for Meadow Periphery Buffer Treatments:

1. Mechanical thinning will occur within the 100-foot meadow Riparian Management Area (RMA) around selected meadows adjacent to areas proposed for structural restoration (units). Treatments within the meadow RMA will follow wildlife-silvicultural prescriptions, including:
2. Mechanical equipment will be allowed in the outer 50’ of the 100’ meadow buffer where slope gradients are less than 15%.
3. Mechanical equipment, except for masticators moving over their own slash, will not be allowed to turn in the meadow buffer. Ingress and egress of mechanical equipment, except masticators, will be on the same path within the 100’ meadow buffer.

4. Soil disturbance in the RMA that is greater than or equal to 10 feet long and six inches deep in top soil (as opposed to litter or duff) will be immediately rehabilitated by hand restored to replace soil and provide a minimum of 50% ground cover.

    a. Hand thin trees <12" diameter in inner meadow buffer where mechanical equipment cannot reach.

    b. Masticators will be allowed to track and turn in the outer 75' of the 100' buffer if:

    c. Masticators are moving over their own slash

    d. Masticators are working on slopes less than 15%. Slopes exceeding 15% will require review by the district hydrologist, fisheries biologist, or soil scientist.

5. Mechanical thinning will occur where treatment units are proposed, adjacent to the meadow RMA, in the outer 50' and as far as the equipment can reach within the inner 50'of the RMA (see Meadow Implementation Plan). Slash will have a similar treatment in the RMA, as in the adjacent fuel treatment unit, prior to burning. Areas within the meadow RMA where hand thinning is conducted will be hand piled and burn where prescribed fire will occur.

6. In areas where aspen are located within the meadow RMA, conifers greater than 12 inch diameter located within 50 feet of aspen will be hand thinned using stand treatment wildlife-silvcultural prescription, and the boles and limbs will be lopped and scattered and slash will be jack pot burned. Fencing will be constructed around the aspen stand to eliminate cattle grazing of aspen seedlings.

Design Criteria Common to all Meadow Treatments and Restoration:

1. Wildlife and botanical surveys will be conducted prior to any restoration activity to ensure protection of those resources and compliance with all relevant BMP's.

2. To ensure ample perching/foraging posts for great gray owls within meadows proposed for restoration, the terrestrial biologist will survey areas where encroaching conifers are intended for removal, prior to project implementation and may require retention of several young trees per meadow acre. Additional conifers with associated shrubs such as azalea and vaccinium growing at the base of the bole may also be flagged for retention to provide nesting habitat for migratory song birds throughout the meadow.

3. No trees greater than 12" dbh will be felled and all conifer removal will be done by hand.

4. Selected cedar and/or fir trees within the project meadows (>12 inch dbh) may be girdled for snag creation if the area is deemed snag deficient.

5. Trees less than 6-feet tall would be cut and left in place; trees greater than 6-feet tall will be bucked and limbed in place and the slash left to dry for a minimum of six weeks and then piled and burned if not used for restoration.

6. In all cases, native herbaceous vegetation (e.g., sod) removed during restoration activities will be saved and preserved for later planting.

7. Where appropriate, restoration sites will be planted with native willows to expedite and enhance the soil stabilization process. Willows will be harvested locally from the same meadow(s) or meadows in the same watershed and at the same elevation range.

8. Water will be dammed and diverted around the restoration areas during construction. This will be done either by pumping the water using a portable fire pump or by gravity draining impounded water using a 10inches flexible corrugated pipe. Diverted water will be put back into the channel at the bottom of the meadow.

9. A watering system will be devised to ensure that newly re-vegetated areas become established as soon as possible.
10. If rock is used in the restoration structures, it will come from local forest stock piles. Currently rock comes from the tunnel talus at Powerhouse 8 off Forest Road 8S03.
11. All heavy equipment (if used) will be washed before and after each project.
12. Refueling of equipment would follow SNFPA-RCO#1-99, which requires that storage of fuel and refueling occur at least 100 feet from any riparian area (spill kit required onsite during implementation).
13. Ingress by equipment will occur only when soil moisture conditions are low and the ground firm. If equipment does need to enter the meadow, it will only travel and work where the soil is relatively dry, and in all cases, ¾-inch plywood and/or ½-inch polyethylene tread mats will be laid down along the equipment route in order to distribute the load more uniformly over the meadow surface and mitigate any tread damage that may occur.
14. Any ingress routes enlarged and/or created for equipment to access the meadow(s) will be obliterated upon completion of the project or properly closed if access to the project area is required for maintenance within the first five years after completion.
15. As appropriate, meadow restoration sites will have a livestock exclosure for three to five growing seasons to ensure vegetative recovery and prevent damage to the restoration structures.

Prescribed Fire:

1. For the SMZ's defined, a minimum protective ground cover of 50% will be established and continuously maintained from October 15th to June 15th of each year consisting of any combination of living plants, litter, slash, and duff.
    - Living plants must be at least 5 feet high to qualify as protective ground cover.
    - Litter and/or slash must be at least 2 inches deep and made up of material 4 inches or less in diameter to qualify as protective ground cover.
    - Duff or humus must be 2 inches deep to qualify as protective ground cover.
    - The 50% ground cover will be determined by using a series of random 100 point transects.
2. Where ground cover is less than the required 50% minimum, treatment will be applied to increase the protective efficiency of the SMZ/RCA to minimum standards. Treatments may include the establishment of living plants, introduction of litter, slash, or other treatments as prescribed by the district hydrologist or fisheries biologist.
3. Prescribed burning within SMZ/RCA may be implemented as follows: hand piling and burning, jackpot burning, and/or broadcast burning provided that the ground cover is not reduced more than 50%. If the protective ground cover is reduced more than 50%, then protective mitigation measures will have to be employed under the guidance of the district hydrologist or fisheries biologist.
4. Treatment in prescribed burn units will avoid direct lighting for prescribed fire within riparian vegetation and or within 5 feet of the edge of stream channel; prescribed fires may back into riparian vegetation areas.
5. Living woody, riparian vegetation will not be deliberately killed, destroyed or removed. Riparian vegetation includes but is not limited to the following species:

- Maples (Acer spp)
- Alders (Alnus spp)
- Dogwoods (Cornus spp)
- Poplars, cottonwoods, aspens (Populus spp)
- Oaks (Quercus spp)

6. Enough streamside shading will be maintained so as not to adversely affect the existing temperature regimes (confer with the aquatic and fisheries program biologist for more information and guidance for shading requirements).

Stream Crossings:

The greatest potential to affect the hydrologic connectivity of streams and aquatic habitat exists at stream crossings. To minimize the potential for project-related effects on hydrologic connectivity, existing crossings will be used whenever possible. In the event that it is necessary to construct a temporary crossing, the methods used for construction will be selected to avoid or minimize detrimental soil and vegetation disturbance and to maintain hydrologic connectivity between upstream and downstream features. All temporary crossings will be removed following the completion of project-related activities and will be treated as necessary to restore to pre-project conditions (final approval of treatment to pre-project conditions would be done by the timber sale administrator *after* consultation with the district hydrologist and/or forest fisheries biologist). Implementation of the activity-specific BMP's (Appendix F) will further ensure that hydrologic connectivity in streams and special aquatic features not be adversely affected by this decision.

Hydrology – Water Quality

Forest policy and regulations to protect water quality and ensure watershed health are detailed by Best Management Practices (BMP's) described in the FSM 2509.22 - Soil and Water Conservation Handbook Chapter 10 - Water Quality Management Handbook, (USDA, 2011), the Riparian Conservation Objective Standards and Guides as set forth in the Sierra Nevada Forest Plan Amendment (USDA, 2004), and the Sierra National Forest Land and Resource Management Plan (USDA, 1991). General project BMPs with their correspondence design measures are listed in Appendix E.

Soil and Water conservation Practices Handbook, Sierra National Forest Supplement No.1, (FSH2509.22) provides standards for the establishment and management of Streamside Management Zones (SMZ's). Included is the incorporation of RMA's and their functional/hierarchical relationship to SMZ's (All stream courses in the project area would be protected and assigned SMZ's. The stream courses mapped on the project area Maps provide information for development of watercourse protection measures such as:

1. Skidding will be designed in a manner to skid logs away from the drainages and cross drainages at designated locations.
2. Skidding will not occur across perennial creeks, and limited treatment can occur in streams with riparian vegetation.
3. Any project generated material that will cause obstruction of storm flows will be removed.
4. All channels have SMZ's, which are equipment exclusion zones. Materials may be end-lined out of this zone.

5. Perennial streams will have a minimum SMZ of 100 feet; seasonally flowing/intermittent streams will have a minimum SMZ of 50-75 feet and ephemeral channels will have a minimum SMZ of 25 feet based on field investigations. The chart below provides a summary of SMZ by Stream Class (table 8).
6. Treatment in prescribed burn units will avoid direct lighting for prescribed fire within riparian vegetation and or within the SMZ of stream channel; prescribed fires may back into riparian vegetation areas or SMZ's.
7. Within RCAs reduce as much as possible ground disturbing impacts (i.e., soil compaction, vegetation disturbance, etc.).
8. Best Management Practices Evaluation Program form T01 will be utilized to evaluate implementation on those units with SMZ's and other aquatic protection requirements.

Most units have avoided crossing stream channels. The exception is 4th order ephemeral draws. All treatments will be laid out to utilize designated and/or existing crossings.

Table 8. Summary of SMZ by Stream Class

Stream Class	Minimum Ground Cover Density (%)	SMZ Width (feet) 30% Slope	SMZ Width (feet) 40% Slope	SMZ Width (feet) 50% Slope	SMZ Width (feet) 60% Slope	SMZ Width (feet) 70% Slope
I	50	100	130	160	190	220
II	50	75	105	135	165	195
III	50	50	80	110	140	170
IV	50	25	45	65	85	105
V	50	0	0	0	0	0

Ground disturbance from mechanized equipment in Tractor Units (T) 112, 113, 114 will be minimized due to sensitive watershed conditions. Harvest methodologies will employ a "light-on-the-land" approach such as CTL, feller-buncher, whole tree yarding, and grapple piling.

Lands and Special Uses

A number of the approved activities may affect areas under special use permit. Special use permits located within the project area are identified in the Lands and Recreation Specialist Report. The district lands officer will work with permit holders to ensure authorized special use permit sites are clearly identified and visible during project implementation. The following design criteria will allow the Forest Service to meet commitments specified in special use permits:

1. Prior to project implementation, the district lands officer will notify permit holders, in writing, of Forest Service activities planned for implementation near their improvements.
2. The district lands officer will ask permit holders to identify on the ground location(s) of their authorized improvements and/or special use permits sites so they are clearly visible during project implementation. As agreed upon with managers responsible for implementation, permit holders may identify their improvements by using a combination of flagging and surveying stakes. Permit holders will be encouraged to print their name and contact phone numbers on the flagging/stakes with indelible ink that is capable of lasting several years.

3. Improvements (roads, utilities, etc.) authorized under special use permit that are damaged by contractors, operators or force account crews during project activities will be repaired by the contractors, operators or force account to pre-project conditions.
4. All improvements under special use permit, such as utility corridors, will be crossed at designated crossings to avoid damage.
5. The sale administrator will notify the district lands officer as soon as possible if apiary sites will be needed for project activities (i.e. landings). Permit holder will be notified in writing, by the district lands officer, as soon as possible if an apiary site is needed for project activities. Upon notification, an alternative temporary apiary site may be proposed by the Forest Service to the permit holder, if possible.
6. If an apiary site will be used for project activities, the site will be cleared of project debris and brought back to pre-project condition.

Range

The rangeland management specialist will coordinate with the contracting officer and/or sale administrator regarding the timing of vegetation management activities (e.g. fuel break and mastication contract work) that will be conducted in the approved treatments areas adjacent to the stockdrive, which starts at FR8S041 to FR8S027 to FR8S027C and includes Route Numbers 23E297 and 23E272 up towards Mormon Hill ending at the junction of Route Number 23E272 and FR7S007F. The stockdrive includes the following proposed treatment areas: T105, T111, T112, 270, 271 and M405). This coordination is necessary to avoid conflicts with the permitted use of this area under term grazing permit. The stockdrive is used to move cattle from the Castle Peak Allotment up to the Haskell Allotment in early July and for gathering in mid-late September.

Recreation

Developed Campgrounds

The Forest Service operates 1 developed campground, Whisky Falls, in the project area;

In Whisky Falls campground:

1. To avoid conflicts with Forest visitors, a quarter-mile limited operating period (LOP) on harvest activities will be established around the Developed Campground during peak season months from May 1st through September 30th for the affected areas.
2. Outside the LOP and contingent upon the safety of the public, developed campgrounds will be fully accessible to the public on weekends.
3. Stump cuts will be flush cut to ground and treated with borax.
4. Slash or fuels treatment will be timely and completed to ensure the developed campground is clear of accumulated slash, limbs and cut logs, (i.e. removed, piled, burned and/or chipped).
5. Any damage to developed campground structures such as fire rings, tables, bulletin boards, site barriers as a result of project activities will be repaired or replaced immediately, to pre-project condition.
6. The location of landings and staging areas for project equipment with in developed campgrounds will be in coordination with district recreation staff.

Dispersed Camping

Several heavily used, popular dispersed recreation sites are included within the project area, but will not be limited to any prescribed treatment. All of which are accessible along Forest Service system roads.

1. During project activities, access to dispersed camping areas and/or dispersed use areas that are on designated roads or designated trails will continue contingent upon the safety of the Forest visitor.

Off Highway Vehicles (OHV) designated Concentrated Use Areas (CUAs)

There are two designated OHV CUAs within the project area. They are the Whisky Staging (2.3 acres) and Gertrude E and W Parking (.19 acres).

1. Area boundaries will be delineated on the ground by recreation OHV staff using orange/black striped flagging and/or brown fiberglass carsonite posts.
2. The designated CUAs will not be used for landings or staging of equipment.
3. Public safety will be the priority.
4. Vegetation treatment near boundaries will maintain desired visual and recreational characteristics; screening foreground to site, with a natural appearing state.

Designated Motorized Trails

1. Some designated motorized trails in the project area may be used on an “as needed” basis for timber operations i.e skidding, hauling, or moving equipment. Coordination with recreation OHV staff prior to timber harvesting activities is necessary. Note: All designated motorized trails are marked with a brown fiberglass carsonite post with decals showing trail number, skill level and vehicle type markers are posted at the beginning and end of the trail.
2. If necessary, movement of equipment across designated trail will be only at a right angle to trail, only at selected areas of the designated trail and upon consultation with Recreation OHV Staff.
3. If “gouging” or berms occur as a result of moving equipment across a designated trail, trail will immediately be repaired to ensure the safe passage of the forest visitor and brought up to Forest Service motorized trail standards.
4. A clearing limit of 3 feet (from each side of a designated trail) will be established. (FSH 2309.18 Trails Management Handbook)
5. Designated trails will be kept clear of any debris or forest material, burned or otherwise. This includes material with-in trail clearing limits.
6. Directional felling and yarding away from designated trails is required.
7. During project activities, access to the designated trails will continue contingent upon the safety of the Forest visitor.
8. A as a result of project activities, any damage to designated trails or associated trail head facilities, such as trail treads, bulletin boards, or barriers will immediately be repaired or replaced to pre-project condition.

Terrestrial Wildlife

Specific Management Provisions

Forest Service requirements for managing Federally Listed and Forest Service Sensitive species and their habitats are defined in the following documents.

- National Forest Management Act (NFMA)
- Forest Service Manual and Handbooks (FSM/FSH-2670)
- Endangered Species Act (ESA)
- (LRMP) as amended by (2004 SNFPA)

In addition to the LRMP standards and guidelines, the following management actions will help maintain and/or enhance important Pacific fisher and American marten habitat for the selected alternative. These measures include information from the 2008 Conservation Biology Institute Document "Baseline Evaluation of Fisher Habitat and Population Status and Effects of Fires and Fuels Management on Fishers In the Southern Sierra Nevada, Final Report to USDA Forest Service Pacific Southwest Region" (Spencer et al 2008); "An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests" (North et al 2009); and Sierra Nevada Adaptive Management Study Integration Team discussions, fieldtrips to the project area, as well as Land Allocations.

1. Maintain highest canopy cover possible to meet the prescription within stands, aim for 60% immediately post-harvest.
2. Thinning will not remove any trees larger than 30-inch dbh unless they are a direct hazard as defined below in number 4. (SNFPA ROD, pg. 50).
3. Protect all suitable fisher denning habitat with a (LOP) restricting vegetation management activities from March 15 through June 15. This LOP will protect reproductively active fisher and young that may be present in the project area from treatment actions during their denning and early rearing periods.
4. Snags will be felled only if they meet the definition of a danger tree, have the potential to fall across prescribed fire control lines, comprise fuel break integrity, and/or pose a threat to firefighter safety during prescribed fire implementation. Both OSHA 29 CFR 1910.266(c) and FSH 6709.11, glossary define a "danger tree" as *"A standing tree that presents a hazard to employees due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stem or limbs, and the direction and lean of the tree."* Down logs created as a result of snag felling would remain in the stand where needed to meet down log requirements of S&G #10. Snags may be felled within designated fuel breaks where they threaten the integrity of the fuel break, but will adhere to S&G #11 by retaining four of the largest dbh snags per acre. Snags not meeting these criteria will d remain as standing snags within the project area.
5. Retain dense groups of larger trees (greater than 30-inch dbh) with touching crowns at the rate of approximately one group per 2.5 to 3.5 acres. Ideally these groups will contain "defect" trees, those that have cavity and platform creating defects (mistletoe, rot, fork topped, broken limbs and tops) for pacific fisher denning and resting sites. Within these large tree groups, all trees over 20" dbh will be retained. These large tree groups will generally have a residual basal area of 240 ft^2 or more for mixed conifer and 210 ft^2 or more for pine and in many instances may reach 300 to 400 ft^2 per acre. Retention of these large tree groups with higher basal areas and the inclusion of defect trees are designed to maintain the integrity of suitable fisher denning and resting sites throughout the treatment units. Non-treated areas within proposed treatment units, such as riparian areas and steep slopes, will also provide extensive areas of tree group retention as no treatments will be occurring in these areas.

6. In certain incidences, small (five to ten acre) pockets or inclusions of decadent, high quality, dense fisher/spotted owl habitat that are identified in the field during project layout may be dropped from commercial treatment upon field review by the district biologist. A number of predominant trees are often observed within these types of inclusions, which may be remnant old forest pockets not previously logged during the extensive railroad logging that occurred on the district throughout the turn of the century. Due to the high habitat value present in these stands, and in accordance with Standard and Guideline #90 from the SNFPA ROD, this unique habitat inclusion may be removed from the treatment unit and will not be available for commercial entry.

7. Conifers with structural decadence, and/or the potential to become future snags, will be retained throughout the non-treatment areas of the project area. To maintain decadent stand characteristics within the treatment units, conifers >16”inches dbh with structural decadence and/or the potential to become future snags will be identified for retention within the treatment areas. Standard and Guideline #11 provides direction for retention of these structural elements. Within treatment units, conifers with the greatest existing or potential for structural decadence would be retained at an average of 1 every 100 feet. Conifers will be selected using the following characteristics listed in order of priority: evidence of known or potential cavities; broken top; conks or other heart-rot indicators; mistletoe or other abnormal witches broom formation or other diseased or insect damaged trees; teakettle branches; forked top; or broken large branches.

8. Black oaks will be retained throughout the project area. Within the treatment areas, conifers will be removed that overtop black oaks 10 inches dbh and larger, or that otherwise restrict sunlight from reaching them (e.g. from the south and west) now or within 15 years following treatment. The amount of conifer removal will be limited by the overall basal area thinning prescription thresholds. Conifer canopy gaps created through this process not only help promote and retain the vigor of black oaks, but also create habitat heterogeneity. A different treatment method will be applied to older, decadent oaks within the treatment units. These older oaks, generally with visible cavities, represent potential fisher and owl denning or nesting sites. Hiding cover such as shrubs, small trees, and down woody material will be retained around these cavitary oaks. These oak retention areas will be protected with a buffer area 35 feet from the bole, or to the dripline, whichever is greater, where no thinning or fuels treatments will occur.

9. Promote diversity in pine plantation treatment areas larger than 5 acres by creating 1/10 acre openings associated with young black oaks between 4” and 12” dbh, where present, on an average of 1 for every 5 acres to encourage diameter growth of the oak through increased sunlight, release the oak from competition, and encourage future stand heterogeneity. To achieve this, Ponderosa and Jeffrey pine trees within pine plantations will be removed from a 180° swath on the Southern aspect around crowded young black oaks for a 50 foot radius. Species diversity will be increased by selecting vigorous conifer species other than ponderosa and Jeffrey pine for retention during thinning where present. Hardwoods are not planned for removal. (S&G #3; #26).

10. Shrub and understory diversity will be retained throughout the project area. Understory vegetation would be maintained in Old Forest Linkages associated with riparian areas (cooler, moister sites—RMAs); black oak buffer zones; as well as areas where no treatment will be conducted such as heritage resource sites, botanical areas, slopes >35%, and rocky areas. Tree species associated with riparian areas, such as dogwoods, alders, and Willows are not planned for removal. Post sale treatments will retain pockets of understory growth spread throughout the treatment units so that 15-20 percent of the total understory growth will be maintained in

1/10 acre pockets within plantation and wild stand treatment units. This will preserve stand diversity while decreasing the threat posed by ladder fuels.

11. The district biologist will be notified immediately if a nest or den of any TESCP species is discovered within or adjacent to a treatment area so that proper protection measures can be identified and implemented.
12. Temporary roads and skid trails necessary for project implementation will be decommissioned according to the USDA Forest Service (BMP) 2-26 (USDA 2000).
13. Standards and Guidelines 28 and 29 provide guidance for developing and maintaining adequate habitat connectivity within riparian areas. Recent studies (Spencer 2008, North et al. 2009) have also shown that fisher utilize riparian areas as travel corridors between high quality habitat. To provide for this habitat connectivity, design criteria have been developed to incorporate and expand upon established riparian area management zones; i.e. Streamside Management Zones (SMZ) and Riparian Management Areas (RMA) associated with perennial streams (Class I). The forest wildlife biologists have termed these zones (OFL). They incorporate and expand upon the measures required for SMZs and RMAs. OFLs consist of buffers measuring 300 feet total on either side of perennial streams. Design criteria for these Old Forest Linkages are detailed in table 9 and figure 1.

Table 9. Riparian Area Management Zones

Distance from Perennial Stream*	Vegetation Management Activities Allowed within zone	Zone Designation
0-50 feet	No activities allowed	SMZ/RMA/OFL
50-100 feet	No ground disturbing equipment allowed into area (dozers, skidders, etc.) Activities allowed include hand-felling of trees smaller than 12”inches dbh, pile-burning, and equipment reach-in with boom arm. Canopy cover is to remain ≥60%.	SMZ/RMA/OFL
100-150 feet	Mechanical entry is allowed. Trees ≤12” dbh may be removed for fire and fuels reduction purposes by equipment. Canopy cover is to remain ≥60%.	OFL
150-300 feet	Mechanical entry is allowed. Thinning from below would occur. Canopy cover is to remain ≥60%.	OFL

*Distance from perennial stream is measured and applied to each side of the stream from bank-full left and bank-full right.

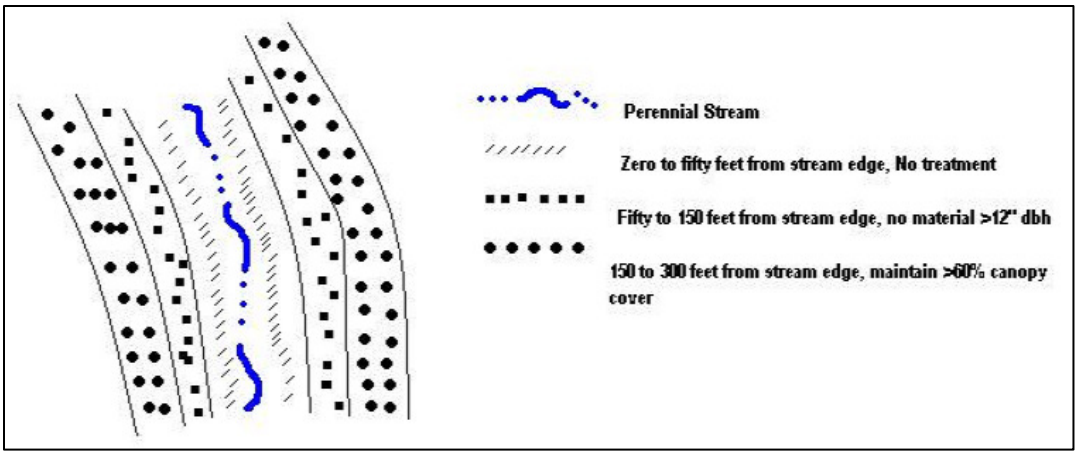

Figure 1: Associated Bounds and Treatments within Old Forest Linkages

Visual Resource

These scenery design features include:

1. Control lines will follow natural contours whenever possible. Underburning operations within view of designated motorized trails, FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking designated concentrated use areas (CUAs) will be low-intensity to minimize the amount of overstory mortality and tree scorching. Islands of unburned vegetation will be retained in some areas to create mosaic vegetative patterns, increase visual interest and attract wildlife. The edges of the islands will be irregularly shaped, feathered and undulated to create a near-natural appearance.
2. Thin, pile, and burn precommercial thinning slash concentrations within view (up to 150-feet) of FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs prior to underburning to reduce understory fuels and mitigate visual disturbances of the prescribed fire.
3. Upon completion of the underburning treatments, the district fuels specialist will consult the landscape architect to select remaining dead trees/shrubs to be cut within view (up to 150-feet) from designated motorized trails (only from sensitive viewing points along motorized trails that will be determined in the field by the landscape architect), FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs. Efforts will be made to cut, pile, and burn these dead trees/shrubs slash concentrations within one year after completion of underburning treatments or as soon as possible.
4. Tree stumps that are within view (up to 150-feet) of FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs will be cut as low to the ground as site conditions (e.g., terrain, rock outcroppings) allow but will not to exceed 6-inch heights from the uphill side.
5. Burn piles within view (up to 150-feet) of designated motorized trails, FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs will burn with more than 90 percent consumption. If 90 percent consumption is not reached (and the remaining fuels still meet the fuels objectives), the remnant slash will be scattered. Efforts will be made to burn these piles

within three years or as soon as possible during low-use recreation season to reduce impacts to forest visitors. Avoid burn piles within Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs, unless approved by the sales administrator after consultation with the landscape architect.

6. Landings within view (up to 150-feet) of designated motorized trails, FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs will be restricted to occur within existing openings whenever possible and landing sizes would be minimized. The edges of the landings will be irregularly shaped, feathered and undulated to create a near-natural appearance and mimic the natural openings in the surrounding landscape. Efforts will be made to burn the landing piles within three years or as soon as possible during low-use recreation season to reduce impacts to forest visitors. Avoid landing piles within Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs, unless approved by the sales administrator after consultation with the landscape architect. Upon completion, landings will be cleaned-up and restored using BMPs such as BMP 1.12 Log Landing Locations and BMP 1.16 Log Landing Erosion Protection and Control.
7. Where possible, in those areas where skid trails and/or fuel break lines are within view from designated motorized trails, FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs, the skid trails and/or fuel break lines would be covered with slash to minimize visual impacts. The following BMPs associated with skid trails, BMP 1.10 Tractor Skidding Design and BMP 1.17 Erosion Control of Skid Trails will be applied.
8. Within view (up to 150-feet) of designated motorized trails, FS Roads 08S09 and 08S70, Whisky Falls Campground, dispersed camping and use areas including Camp 5, and Whisky Staging and Gertrude E and W Parking CUAs, previously constructed temporary roads will be re-opened whenever possible. Temporary roads will be constructed in a manner that closely duplicates the existing contour lines, with a minimum degree of landform alteration limiting the amount of earthwork. Excessive cut and fill slopes for road construction will be avoided. Straight linear road construction, rock outcrops, and/or sensitive areas will be avoided. Upon completion, where the road access is no longer necessary to implement the project, the temporary roads will be restored using BMPs such as BMP 2.2 General Guidelines for the Location and Design of Roads and BMP 2.7 Road Decommissioning. The temporary roads will be closed with naturally-shaped earth mounds, native boulders, or logs to discourage use.

Appendix E – Best Management Practices (BMPs) for Water Quality Protection

(From R5 FSH 2509.22 Soils and Water Conservation Handbook, Chapter 10 – Water Quality Management Handbook, USDA Forest Service, 2011)

Timber Management Activities

The following are the BMPs for the control of nonpoint source pollution associated with timber management activities. The line officer on each administrative subunit is responsible for fully implementing the directives that provide for water-quality protection and improvement during timber harvest and management activities.

Earth scientists and other trained and qualified individuals are available to work with the timber management work force to provide technical assistance in identifying beneficial uses, the most recent state-of-the-art water-quality control, methods and techniques, and evaluation of results.

BMP 1.1 - Timber Sale Planning Process

Objective: To incorporate water-quality and hydrologic considerations into the timber sale planning process.

Explanation: The interdisciplinary team will address potential water-quality problems and provide for administrative controls, corrective treatments, and preventive measures. As warranted, a qualified specialist will define and quantify the potential changes to water quality and instream beneficial uses.

The result is an environmental document and sale contract(s). These documents describe methods to prevent unacceptable effects to water quality during and following sale layout and logging operations. They document mitigation measures to ameliorate, and/or preclude adverse effects for those treated areas. Silvicultural treatment is excluded from environmentally sensitive areas where adverse environmental effects from the activity cannot be mitigated to conform to Federal, State, and local water-quality standards.

Implementation: Earth scientists or other trained and qualified individuals participate in the environmental documentation process to evaluate onsite watershed characteristics and potential environmental consequences of the proposed timber harvest and related activities. They design the timber sale to include site-specific prescriptions for each area of water-quality concern. The resulting contract would include those provisions set forth in the environmental document to meet water-quality protection objectives.

BMP 1.4 - Using Sale Area Maps and/or Project Maps for Designating Water-Quality Protection Needs

Objective: To ensure recognition and protection of areas related to water-quality protection delineated on a sale-area map or a project map.

Explanation: This is an administrative and preventative practice. The following are examples of water-quality protection features that pre-sale foresters will designate on the sale area map or project map, thereby ensuring their incorporation as timber sale contract requirements:

1. Location of streamcourses and riparian zones to be protected, including the width of the protection zone required for each stream

2. Wetlands (meadows, lakes, springs, and so forth) to be protected

3. Boundaries of harvest units

4. Specified roads

5. Roads where log hauling is prohibited, or restricted

6. Structural improvement

7. Area of different skidding and/or yarding method application

8. Sources of rock for road work, riprapping, and borrow materials

9. Water sources that are available for purchasers' use

10. Other features that are required by contract provisions

11. Site preparation/fuel treatment

Implementation: The interdisciplinary team will identify and delineate these and other features on maps, as part of the environmental documentation process. The Sale Preparation Forester will include them on the sale area map at the time of contract preparation. The sale administrator and the purchaser will review these areas on the ground before commencing harvest.

BMP 1.5 - Limiting the Operating Period of Timber Sale Activities

Objective: To ensure that the purchasers conduct their operations, including, erosion-control work, road maintenance, and so forth, in a timely manner, within the time specified in the timber sale contract.

Explanation: Contract provision C6.3, “Plan of Operation” is required in all timber sale contracts. This provision states that the purchaser must submit a general plan of operation which will set forth planned periods for, and methods of road construction, timber harvesting, completion of slash disposal, erosion-control work, and other contractual requirements. Forest Service written approval of the Plan of Operation is prerequisite to commencement of the purchaser's operation. Contract clause B6.31, “Operation Schedule,” requires that the purchaser provide an annual schedule of anticipated activities such as road maintenance and erosion-control work until the sale is closed. Contract clause C6.313, “Limited Operating Period,” will be used in a contract to limit the purchaser's operation to specified periods when adverse environmental effects are unlikely. Contract provision B6.6 can be used to close down operations due to the rainy season, high water, and other adverse operating conditions, to protect resources.

Implementation: During the timber sale planning process, the interdisciplinary team will identify and recommend limited operating periods. The Sale Preparation Forester prepares the contract to

include clause C6.313. Provisions B6.3, B6.31, and C6.3 are all mandatory provisions of the timber sale contract. Provision C6.3 is mandatory only for sales over a 2.year contract period. The purchaser must submit a general plan and annual plans to the Forest Service. The purchaser may commence operations only after written Forest Service approval of the general plan under C6.3.

BMP 1.8 - Streamside Management Zone Designation

Objective: To designate a zone along riparian areas, streams, and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.

Explanation: As a preventive measure, roads, skid trails, landings, and other timber-harvesting facilities will be kept at a prescribed distance from designated stream courses.

Factors such as stream class, channel aspect, channel stability, sideslope steepness, and slope stability will be considered in determining the limitations on activities within the width of streamside management zones (SMZ). Aquatic and riparian habitat, beneficial riparian zone functions, their condition and their estimated response to the proposed timber sale will also evaluated in determining the need for and width of the streamside management zones.

The SMZ will be a zone of total exclusion of activity, or a zone of closely managed activity as described in the “Glossary of Terms.” It is a zone that acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habitats; protects channel and streambanks; and promotes floodplain stability.

Implementation: Identify the streamside management zone requirements during the environmental documentation process. Each forest's LRMP identifies specific measures to protect these zones. As a minimum, forest requirements must be identified and implemented. The timber sale project is designed to include site-specific prescriptions for preventing sedimentation and other stream damage from logging debris. The timber sale contract will be designed to ensure retention of streamside vegetation and improve the condition and beneficial functions of the riparian area.

As appropriate, water-quality monitoring is identified in the environmental document. The Timber Sale Preparation Forester is responsible for including the zones in the timber sale contract and on the sale area map as identified by the environmental document. The sale administrator is responsible for contract compliance during harvest operations.

BMP 1.9 - Determining Tractor-loggable Ground

Objective: To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.

Explanation: This preventative practice is intended to minimize accelerated soil erosion and sedimentation, and water-quality degradation. To determine tractor-loggable ground, consider physical site characteristics such as steepness of slopes, landslide prone areas, and soil properties. The EHR is one method. For example, where the post-tractor logging EHR is predicted to be “moderate,” an onsite evaluation is conducted to determine the need for erosion-control measures. Where the post-tractor logging EHR is predicted to be ”high,” or “very high,” erosion-control

measures are required to reduce the risk of accelerated erosion. Avoid tractor logging where the predicted, post-logging erosion hazard cannot be reduced to either “low” or “moderate.”

Implementation: A trained and qualified Forest Service employee will evaluate the EHR during the on-the-ground planning phase of the timber sale. This work is done within each sale area by evaluating representative sites. The resulting EHRs are considered during the selection of logging methods and silvicultural prescriptions, of erosion-control measures to reduce risk, and in determining the intensity of and controls for land-disturbing activities.

Interpretations of the considerations are described in the environmental document. Provisions in the timber sale contract specify the areas, determined by the EHR, upon which tractors can operate.

BMP 1.10 - Tractor Skidding Design

Objective: By designing skidding patterns to best fit the terrain, the volume, velocity, concentration, and direction of runoff water can be controlled in a manner that would minimize erosion and sedimentation.

Explanation: This is a preventative practice. Watershed factors considered include slope, soil stability, exposure, SMZs, meadows, and other factors that may affect the surface water runoff and sediment yield potential of the land. The careful control of skidding patterns serves to avoid onsite and downstream channel instability, build-up of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and SMZs.

Methods for protecting water quality while utilizing tractor skid trail systems are:

1. End-Lining. This method involves winching the log directly out of the sensitive areas (such as SMZs and meadows) with a cable operated from outside the sensitive area. In this manner, logs can be removed from the sensitive areas, while avoiding encroachment by heavy equipment and associated adverse environmental effects.

2. Felling to the Lead. This method involves felling trees toward a predetermined skid pattern. This procedure facilitates an uncomplicated approach of the tractor operating between the log and the skid trail. Soil disturbance and compaction are consequently lessened, and residual stand and site damage is minimized.

3. Specialized Equipment Access. Specialized equipment (harvesters, feller bunchers) having low ground pressures can move in and out of selected SMZs without turning and leaving disturbed ground.

Implementation: For skid trail design, sensitive areas will be identified and evaluated in the environmental documentation process during the timber sale planning process. When needed to protect water quality, prescriptions must be included in the basic TSC by the use of special contract provisions (C-clauses). The sale administrator then executes the prescription on the ground by locating the skid trails with the timber purchaser, or by agreeing to the purchaser's proposed locations prior to construction. Guidelines for skid trail locations are referenced in the sale administrator Handbook, and will be in the environmental documentation and the timber sale contract.

BMP 1.12 - Log Landing Location

Objective: To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water-quality degradation.

Explanation: This practice is both administrative and preventive. The location of and clearing limits for log landings are commonly evaluated by the interdisciplinary team, and are agreed to by the sale administrator and purchaser prior to construction. The following criteria will be used by the sale administrator in evaluating landings:

1. The cleared or excavated size of landings will not exceed that needed for safe and efficient skidding and loading operations. Trees considered dangerous will be removed around landings to meet the safety requirements of the Occupational Safety and Health Administration (OSHA).

2. To the extent feasible, select landing locations that involve the least amount of excavation and the least erosion potential, and are well outside of the SMZ.

3. Where feasible, locate landings near ridges away from headwater swales in areas that will allow skidding without crossing channels, violating the SMZ, or causing direct deposit of soil and debris to the stream.

4. Locate landings where the least number of skid roads will be required, and sidecast can be stabilized without entering drainages, or affecting other sensitive areas.

5. Position landings such that the skid road approach will be as nearly level as feasible, to promote safety, and protect the soil from erosion.

6. Keep to a minimum the number of skid trails entering a landing.

7. Avoid excessive fills associated with landings constructed on old landslide benches. Do not change the mass balance to point to destabilize the landslide.

8. Construct stable landing fills or improve existing landings by using appropriate compaction and drainage specifications. Engineered fills will be needed under certain conditions.

Implementation: The sale administrator must agree to landing locations proposed by the purchaser or their representatives. Relying on interdiscipliinary team input and the stated criteria, the sale administrator can negotiate to select mutually acceptable landing locations—other than those identified in the NEPA document. To be an acceptable landing, it must meet the above criteria. Should agreement not be reached, the decision of the Forest Service will prevail within contract limitations.

BMP 1.13 - Erosion Prevention and Control Measures during Timber Sale Operations

Objective: To ensure that the purchasers' operations will be conducted reasonably to minimize soil erosion.

Explanation: Timber is purchased by individuals or companies who either harvest the timber themselves, or sub-contract to other parties. Therefore, it is necessary to ensure that purchasers and their sub-contractors understand and adhere to water-quality BMP prescriptions formulated during the timber sale planning process. This is accomplished by setting forth the purchaser's responsibilities in the timber sale contract, and holding the purchaser accountable for actions of their sub-contractor.

Implementation: Equipment will not be operated when ground conditions are such that excessive damage would result. The kinds and intensity of control work required of the purchaser will be adjusted to ground and weather conditions, with emphasis on the need to control overland runoff, erosion, and sedimentation. Erosion-control work required by the contract will be kept current. At certain times of the year this means daily, if precipitation is likely, or at least weekly when precipitation is predicted for the weekend.

If the purchaser fails to perform seasonal erosion-control work prior to any seasonal period of precipitation, or runoff, the Forest Service may temporarily assume responsibility, complete the work, and use any unencumbered deposits as payment for the work.

BMP 1.16 - Log Landing Erosion Control

Objective: To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.

Explanation: This practice uses administrative, preventive, and corrective controls to meet the objective. The Sale Planning Forester and sale administrator assess the need for stabilization, with the assistance of earth scientists as needed.

Implementation: Timber sale contract requirements provide for erosion prevention and control measures on all landings. The Timber Sale Preparation Forester will include provisions in the timber sale contract for landings to have proper drainage. After landings have served the purchaser's purpose, the purchaser will ditch, or slope the landings, and may be required to rip or subsoil and make provisions for revegetation to permit the drainage and dispersion of water. Erosion-prevention measures such as waterbars will be constructed to divert water away from landings.

Other provisions may include aggregate surfacing; scarifying; smoothing and sloping; construction of drainage ditches; spreading slash; covering with mulch or wood chips; or applying straw mulch. Prevent road drainage from reaching landings. Unless agreed otherwise, cut and fill banks around landings will be reshaped to stabilize the area.

The specific work needed on each landing will depend on the actual onsite conditions. The sale administrator is responsible for ensuring that this practice is properly implemented on the ground. The sale administrator will agree upon the location and size of log landings proposed by the purchaser before clearing and construction begins.

BMP 1.17 - Erosion Control on Skid Trails

Objective: To protect water quality by minimizing erosion and sedimentation derived from skid trails.

Explanation: This practice uses preventive controls to reach the objective.

The timber sale contract requires the installation of erosion-control measures on skid trails, tractor roads, and temporary roads. Normally, the work involves constructing cross ditches and water-spreading ditches. Other methods such as backblading will be agreed to in lieu of cross drains. Grass seeding or other erosion-control and compaction remediation measures may also be required by a “C” provision, which will be added to the timber sale contract. Areas to be treated

are shown on the sale area map legend. During the life of the contract, these areas are designated on the ground annually as logging and temporary access construction progresses.

Implementation: Locations of all erosion-control measures are designated and agreed to on the ground by the sale administrator. The sale administrator handbook section on Skid Trails and Firelines contains guidelines for spacing of cross drains, construction techniques, and cross drain heights. The sale administrator will use these guidelines on the ground to identify site-specific preventive work that is required of the purchaser. The purchaser is obligated to complete and maintain erosion-control work specified in contract provisions during the life of the contract.

BMP 1.18 - Meadow Protection during Timber Harvesting

Objective: To avoid damage to the ground cover, soil, and the hydrologic function of meadows.

Explanation: This is an administrative and preventive action. The interdisciplinary team has identified these sensitive environments during the scoping and onsite evaluation portion of the environmental document preparation process. As a minimum, meadow protection requirements contained in the forest LRMP must be identified and implemented. Trained and qualified Forest Service employees will assess these areas. Protection zones and tree directional felling are prescribed according to site conditions and within guidelines provided by the Forest Service directive system and the LRMP guidelines.

The timber sale contract prohibits unauthorized operation of vehicular or skidding equipment in meadows or in protection zones designated on sale area maps and marked on the ground. Vehicular or skidding equipment is not to be used on meadows except when specifically approved by the sale administrator. Where feasible, directional felling will be used to avoid felling trees into meadows. Unless otherwise agreed, trees felled into meadows will be removed by end-lining, slash removed, and resulting disturbance will be repaired where necessary to protect vegetative cover, soil, and water quality.

Implementation: The concerns and requirements will be set forth in the timber sale contract requirements for sale areas with meadow land. The contract may also specify that a purchaser is subject to liquidated damage charges each time equipment enters a designated meadow. The purchaser will repair damage to these designated areas and/or their associated protection zones in a timely manner, as agreed to by the sale administrator.

The purchaser will repair damage to a streamcourse, or SMZs caused by unauthorized purchasers' operations in a timely and agreed-upon manner.

BMP 1.19 - Streamcourse and Aquatic Protection

1. **Objectives:**

    a. To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values.

    b. To provide unobstructed passage of stormflows.

    c. To control sediment and other pollutants entering streamcourses.

d. To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.

Explanation: This management practice uses administrative, preventive, and corrective measures to meet the objectives.

Streams within proposed timber sale areas are surveyed and protection zones are prescribed during the timber sale planning process. The interdisciplinary team has formulated stream-protection requirements, and these have been included in the prescription in this decision document. The requirements are then included in the timber sale contract and identified on the sale area map.

2. The following principles are fundamental to protecting streamcourses:

a. The sale administrator must agree to location and method of streamcourse crossings prior to construction. This is done at the same time as agreements are made with the purchaser or purchaser's representative for the locations of landings, skid trails, tractor roads, and temporary roads.

b. All damage to a streamcourse, including damage to banks and channels, will be repaired to the extent practicable.

c. All sale-generated debris is removed from streamcourses, unless otherwise agreed to by the sale administrator, and in an agreed-upon manner that will cause the least disturbance.

d. Limit, or exclude equipment use in designated SMZs. Widths of SMZ and restrictions pertaining to equipment use are defined by onsite project investigation and are included in the timber sale contract. The Forest Service identifies these areas on the sale area map prior to advertising. Boundaries of zones will be modified by agreement between the contractor and sale administrator, to compensate for unforeseen operation conditions.

e. Methods for protecting water quality while utilizing tractor skid trail design in streamcourse areas where harvest is approved include: 1) end lining, 2) felling to the lead, and 3) utilizing specialized equipment with low ground pressure such as a feller buncher harvester. Permit equipment to enter streamside areas only at locations agreed to by the sale administrator and the purchaser.

f. Water bars and other erosion-control structures will be located so as to disperse concentrated flows and filter out suspended sediments prior to entry into streamcourse.

g. Material from temporary road and skid trail streamcourse crossings is removed and streambanks restored to the extent practicable.

h. In cable log yarding operations, logs will be fully airborne within the SMZ, when required by the timber sale contract.

i. Special slash-treatment site-preparation activities will be prescribed in sensitive areas to facilitate slash disposal without use of mechanized equipment.

Implementation: The sale administrator works with the purchaser's representative to ensure that the timber sale contract clauses covering the above items are carried out on the ground.

Specialists can be called upon to help the sale administrator with decisions. In the event the purchaser causes debris to enter streamcourses in amounts which may adversely affect the natural flow of the stream, water quality, or fishery resource, the purchaser will remove such debris as soon as practicable, but not to exceed 48 hours, and in an agreed-upon manner that will cause the least disturbance to streamcourses.

BMP 1.20 - Erosion-control Structure Maintenance

Objective: To ensure that constructed erosion-control structures are stabilized and working.

Explanation: Erosion-control structures are only effective when they are in good repair and function as designed. Once the erosion-control structures are constructed, there is a possibility that they may not become adequately effective, or they would become damaged from subsequent harvest activities. It is necessary to provide follow-up inspection and structural maintenance to avoid these problems and ensure adequate erosion control.

Implementation: During the period of the timber sale contract, the purchaser would provide maintenance of soil erosion-control structures constructed by the purchaser until they become stabilized, but not for more than one year after their construction. After one year, accomplish needed erosion-control maintenance work using other funding sources under timber sale contract provisions B6.6 and B6.66.

The Forest Service may agree to perform such structure maintenance under timber sale contract provision B4.225 (Cooperative Deposits), if requested by the purchaser, subject to agreement on rates. If the purchaser fails to do seasonal maintenance work, the Forest Service may assume responsibility and charge the purchaser accordingly.

BMP 1.21 - Acceptance of Timber Sale Erosion-control Measures before Sale Closure

Objective: To ensure the adequacy of required erosion-control work on timber sales.

Explanation: The effectiveness of soil erosion prevention and control measures is determined by the conditions found after sale areas have been exposed for one, or more years to the elements. The evaluation is to ensure that erosion-control treatments are in good repair and functioning as designed before releasing the purchaser from the contract responsibility.

Although a careful check is required before a timber sale is closed to ensure that planned erosion work has been completed to the standard prescribed, the erosion prevention work done in previous years must also be inspected during the life of the timber sale. These inspections would help determine whether the planned work was adequate, if maintenance work is needed, the practicability of the various treatments used, and the necessity for modifying present standards, or procedures.

Implementation: “Acceptable” erosion control means only minor deviation from established objectives, provided no major, or lasting damage is caused to soil, or water. Sale administrators would not accept erosion-control measures that fail to meet these criteria. Specific requirements for erosion control are included in each timber sale contract and the sale administrator handbook.

BMP 1.22 - Slash Treatment in Sensitive Areas

Objective: To maintain or improve water quality by protecting sensitive areas from degradation which would likely result from using mechanized equipment for slash disposal.

Explanation: Special slash treatment site preparation will be prescribed in sensitive areas to facilitate slash disposal without use of mechanized equipment. Meadows, wetlands, SMZs, and landslide areas are typically sensitive areas where equipment use is normally prohibited. Slash-treatment and site-preparation methods are specified in environmental documents, where applicable, for each cut unit in project and contract documents such as a timber sale contract, project map, or sale area map.

Implementation: An assessment of the sale area will be made in the timber sale planning process. Sensitive areas requiring protection are identified. Assessment results will be documented in the environmental document, and identified in the timber sale contract and on the sale area map. The sale administrator, contract inspector, or Forest Service specialist will inspect the treatment for correct and satisfactory slash disposal accomplishment.

Road Management Activities

The purpose of this set of BMPs is to control nonpoint source pollution that may occur as a result of road (and motorized trail) management activities on NFS lands in the Pacific Southwest Region. Activities associated with road (and motorized trail) management include travel route planning, design, construction, operation, maintenance, reconstruction, storage, and decommissioning.

Considering the proportion of the landscape that they occupy, roads are a prevalent cause of hydrologic and geomorphic process alteration on NFS lands. Highly compacted road surfaces generate infiltration-excess overland flow, even during small precipitation events. In addition, cut slopes can intercept transient hillslope groundwater (that is, subsurface stormflow) when the height of the cut slope exceeds the depth to the water table. This runoff is laterally redistributed and often concentrated along inside ditches or the running surface, where it is discharged to hillslopes below the road or trail prism or routed directly into streams. These hydrologic process and pathway alterations largely drive the water-quality impacts associated with roads.

When roads and associated drainage-control features contribute flow directly to a natural waterbody, they become part of the drainage network and are said to be hydrologically connected. These drainage systems may further increase hydrologic connectivity if they deteriorate because of use, weather, or inadequate maintenance. Drainage facilities may be inadequate after wildfires or extreme precipitation events, due to increased surface runoff, loss of vegetative cover, and stream bulking, and can increase the length of road hydrologically connected to the stream network. Furthermore, many slope disturbances are spatially linked to the road network, and roads are often the pathway for transporting pollutants from these other types of disturbances (for example, dispersed recreation). Hydrologically disconnecting roads is a fundamental practice for eliminating chronic water-quality impacts from roads and other disturbances.

Location and design strongly influence the risk and degree of road and trail impacts on water, aquatic and riparian resources, as can maintenance practices. Roads located adjacent to unstable slopes, streams, lakes, wetlands, springs, and other waters are particularly susceptible to causing adverse impacts. Proper road and trail design, construction, maintenance, and operation can reduce impacts to natural hydrogeomorphic functions and water resources.

Stream crossings are the most frequent location of adverse road and trail impacts to water, aquatic, and riparian resources. Road surfaces typically drain toward crossings, so the likelihood of connectivity of road surface with channels is greatest. Crossings comprised of fine-grained native materials may erode and deliver sediment to channels. Culverts may be inadequately sized to properly pass flow, bedload and debris and, due to size and/or gradient, may present barriers to fish and aquatic organism movement. Crossings also present the risk of catastrophic failure if flood flows exceed crossing capacity. In such cases the crossing fill may be lost. In the worst case scenario, crossing failure results in diversion of flows from the channel onto the adjacent roadway. For these reasons, management activities conducted at crossings are vitally important to water, aquatic, and riparian resources, and are emphasized in the BMPs that follow.

The following BMPs are to be applied as needed to prevent adverse impacts of road management activities on water, aquatic, and riparian resources to the extent possible. BMPs range from suggested practices to prohibitions, as required by Forest Service directives.

Section 404 permits, so named because they were created under section 404 of the Clean Water Act, are required for discharges of dredged or fill materials to waters of the United States, including wetlands. They are administered by the U.S. Army Corps of Engineers. Section 401 Water Quality Certifications are completed for section 404 permits and any other permit issued by a Federal agency for a project with potential to affect water quality. In California, Regional Water Boards administer section 401 Water Quality Certifications. Each section 404 permit needs a section 401 Water Quality Certification UNLESS the section 404 permit is obtained under a nationwide permit that has a “blanket” Water Quality Certification.

National Pollutant Discharge Elimination System (NPDES) permits may also be required. Forest Service engineers and hydrologists would work together during the permitting process.

BMP 2.2 - General Guidelines for the Location and Design of Roads

Objective: Locate roads to minimize problems and risks to water; aquatic, and riparian resources. Incorporate measures that prevent or reduce impacts, through design for construction, reconstruction, and other route system improvements.

Explanation: A road’s location and design may have long term effects on water quality, construction and maintenance costs, safety, and other public resources. Road location and design control hydrologic connectivity—the degree that road runoff and sediment are linked to the stream channel network. The extent of hydrologic connectivity, along with the magnitude and frequency of road erosion, drives road-related water-quality impacts.

Roads are located according to standards and specifications to meet their use objectives, while protecting other resources. Well-defined project objectives are necessary to locate and design roads that would best address environmental and resources issues, as well as safety and traffic requirements.

Designs of new roads and upgrades to existing roads consider ways to reduce impacts to beneficial uses of water. Management needs have changed considerably since most NFS roads were constructed. Influences of roads on aquatic and riparian resources are recognized and considered. Road maintenance budgets and opportunities have diminished. Designs for improvements to existing roads significantly reduce or eliminate impacts to beneficial uses of water. Drainage features and surfacing are among elements often considered for change.

Improvements to the road system are made on a priority basis that considers road and resource condition, beneficial uses at risk, and cost.

In addition, some situations may require adherence to special conditions associated with Clean Water Act permits for water quality certification (401), stormwater (402), and discharge of dredge and fill material (404). State and local entities may also provide guidance and regulations such as a Forest Practices Act or a Stream Alteration Act. Forest plans often contain direction on location of roads relative to streams, wetlands, and unstable landforms.

The risk from road management activities can be managed by using the appropriate techniques for road location and design from the following list, and adapted as needed to local site conditions.

Implementation: Implementation considers new road location, relocation, and design only. Construction, reconstruction, maintenance, decommissioning, and erosion control are covered in subsequent BMPs.

Location:

1. Avoid locating new roads where water-quality risks outweigh beneficial uses.

2. Locate roads to fit the terrain, limit the need for excavation, and prevent damage to improvements and resources.

3. Avoid sensitive areas such as riparian areas, wetlands, meadows, bogs, fens, inner gorges, overly steep slopes, and unstable landforms to the extent practicable. If such areas cannot be avoided:

    a. Use bridges or raised prisms with diffuse drainage to sustain flow patterns

    b. Set crossing bottoms at natural levels of channel beds and wet meadow surfaces

    c. Avoid actions that may dewater or reduce water budgets in wetlands. Consider compensatory mitigation or mitigation banking.

4. Locate roads outside SMZs whenever possible, with a minimum of number of crossings and connections between the road and streams.

5. Relocate existing routes or segments that are in high-risk locations, including the SMZ, to the extent practicable.

6. Relocate roads that are causing uncontrollable adverse effects to beneficial uses of water, with commensurate decommissioning of high-risk roads.

7. Consider potential for generation of waste material in location of roads, and need for access to appropriate disposal areas. Waste or spoil may not be placed within SMZs, on slopes greater than 60 percent, on unstable slopes, or in areas subject to converging runoff.

8. Locate roads in an interdisciplinary manner with a hydrologist, soils scientist, and geologist, if necessary.

9. Final road location drives design features, assuring protection of water quality. Incorporate modeling as necessary to assist with design of road segments displaying higher erosion potential.

Design:

1. Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible.

a. Consider full bench construction or mechanically stabilized fills on unstable slopes or slopes greater than 60 percent.

b. Ensure design addresses method to stabilize constructed fill slopes, including key ways where fill slopes exceed 3 feet in height at the hinge point.

c. Do not design to discharge runoff on to unstable landforms, such as hollows.

2. Design road surfaces to dissipate intercepted water in a uniform manner along the road by outsloping, insloping with drains, or crowning with drains, subject to site soil characteristics to prevent the discharge of sediment to surface waters.

3. Design to reduce the hydrologic connectivity of the road segment or network.

4. Limit occurrence of connectivity areas to water crossings only, if possible.

5. Choose low-maintenance designs (for example, outsloping and rolling the grade) for roads that may be subject to minimal use or would be put in storage.

6. Follow general principles of stormwater and erosion control related to roads including permanent and temporary controls that:

a. Minimize soil compaction (except as needed to achieve compaction standards on road prism) and bare ground coverage.

b. Separate exposed bare ground from surface waters. Incorporate vegetation or slash over exposed fill slopes.

c. Design stable road prisms and stream crossings.

d. Use geotextiles when necessary to avoid mixing aggregate with subgrade and subsequent rutting of road.

7. Employ treatments that control stormwater and erosion at the source through the use of small-scale treatments distributed throughout the road prism.

8. Design properly spaced cross drains to provide maximum filter distance and to limit hydrologic connectivity between the road and water resource where practicable.

9 Design subsurface dispersion measures and cross drains as necessary to capture and disperse expected flows contributed by locally Willow groundwater and road surfaces.

10. Design energy dissipaters, apron, downspouts, gabions, flumes, oversize drains and debris racks, culvert and cross drain inlets and outlets, where needed to prevent erosion and discharge of sediment to surface waters. Do not discharge runoff on to unstable surfaces.

11. Design stable ditch configuration that does not erode, yet does not fail during mechanical maintenance activity

12. Carefully consider impacts vs. benefits of berm in the control of runoff. Avoid berms except where needed to facilitate drainage patterns without adverse impact to water quality.

13. Design spot surface treatments to areas that are sensitive, erodible, subject to high seasonal water tables, or would be heavily traveled.

14. For roads located within the SMZ where adequate buffer zone does not exist, design for aggregate or paved surface. Design for a floodplain surface to slow water velocities and minimize erosion by flood flows (energy dissipation).

15. Generally use the minimum road standards for grade and alignment (width, turning radius, maximum slope) to accommodate the design vehicle and traffic mix and volume.

16. Consider maintenance requirements in road design.

17. For roads to be reconstructed, incorporate design features to reduce or eliminate identified water-quality impacts.

Crossings:

1. Design both temporary and system roads to limit the number of surface-water crossings necessary to meet planned activity objectives and safety requirements.

2. When necessary to cross streams, find optimal places for road-stream crossings. If possible avoid:

a. Areas requiring steep road approaches.

b. Crossing braided or migrating stream channels.

c. Flat stream gradient immediately downstream of steep stream gradients.

d. Areas requiring deep fills.

e. Areas immediately downstream of unstable slopes or landforms.

3. Design crossing approaches so road surfaces and drainage features have minimum hydrologic connectivity with channels.

4. Design diversion potential dips at existing crossings where there is a risk of flow diversion or where crossing fills are higher than approaches. Consider hardened fills commensurate with fill height. Consult with hydrologist.

5. Design stream-crossing structures to provide the most resource protection consistent with facility needs, legal obligations, and cost considerations.

6. Provide for desired passage of aquatic and terrestrial organisms, debris, and bedload as well as flow.

a. Size crossings for the 100-year flood event, plus associated debris and sediment, or greater.

b. Design for stream simulation if feasible in consultation with hydrologists and fisheries biologists.

7. Consider using culvert arrays, perched culverts and/or permeable fills in meadow environments or areas with naturally high water tables to encourage meadow function.

BMP 2.3 - Road Construction and Reconstruction

Objective: Minimize erosion and sediment delivery from roads during road construction or reconstruction, and their related activities.

Explanation: During road construction and reconstruction activities, vegetation and ground cover are removed, often exposing both the surface and subsurface soil to erosion. Temporary and long term erosion-control measures are necessary to reduce erosion and maintain overall slope stability. These erosion-control measures may include vegetative and structural techniques to ensure the area's long term stability. The risk from road construction and reconstruction activities can be managed by using the appropriate techniques from the following list adapted as needed to local site conditions.

Implementation: Enforcement of the techniques is the responsibility of the inspector and contracting officer's representative for public works contracts, the inspector and engineering representative for timber sale roads, and the permit administrator for roads constructed or reconstructed under administrative operations (that is, Road Use Permit, Special Use Permit, and so forth). If roads are constructed or reconstructed by force account crews, the project manager and foreman are responsible for adherence to project drawings, specifications, and erosion control plan.

1. Implement the approved erosion control plan that covers all disturbed areas, including borrow areas and stockpiles used during road management activities (see BMP 2.13- Erosion Control Plan). Include the forest's wet weather operations standards (WWOS).

2. Maintain erosion-control measures to function effectively throughout the project area during road construction and reconstruction, and in accordance with the approved erosion control plan (see BMP 2.13- Erosion Control Plan).

3. Set the minimum construction limits needed for the project and confine disturbance to that area.

4. Locate and designate waste areas before operations begin.

a. Deposit and stabilize excess and unsuitable materials only is designated sites.

b. Do not place such materials on slopes with a high risk of mass failure, in areas subject to overland flow (for example, convergent areas subject to saturation overland flow), or within the SMZ.

c. Provide adequate surface drainage and erosion protection at disposal sites.

d. Comply with BMP 2.5 - Water Source Development and Utilization.

5. Comply with BMP 2.11 - Equipment Refueling and Servicing.

6. Do not permit sidecasting within the SMZ. Prevent excavated materials from entering water ways or SMZs.

7. Develop and follow blasting plans to move materials when necessary.

a. To the extent possible, restrict blasting in sensitive areas and those sites with high landslide potential.

b. Restrict blasting after intense storms when soils are saturated.

c. Prevent damage from fly rock and overshot by not overloading shots, installing blasting mats, or avoiding setting charges through variable rock strata.

8. Schedule operations when rain, runoff, wet soils, snowmelt or frost melt are less likely. Follow seasonal restrictions of the forest's WWOS, and notification protocols, as outlined in an approved erosion control plan.

a. Optimally, schedule construction during dry periods, while still adhering to other seasonal restrictions (wildlife breeding, spawning, fire activity levels, and so forth), consistent with local ordinances.

b. Stabilize project area during normal operating season when the National Weather Service predicts a 30 percent or greater chance of precipitation, such as localized thunderstorm or approaching frontal system.

c. Keep erosion-control measures sufficiently effective during ground disturbance to allow rapid closure when weather conditions deteriorate.

d. Complete all necessary stabilization measures prior to predicted precipitation that could result in surface runoff.

9. To the extent possible, construct new stream crossings when streams are dry or when stream flow is at its lowest. Install sediment controls.

10. Comply with BMP 2.8- Stream Crossings.

11. Limit operation of equipment when ground conditions could result in excessive rutting, soil compaction (except on the road prism or other surface to be compacted), or runoff of sediments directly to streams.

12. On slopes greater than 40 percent, the organic layer of the soil would be removed prior to fill placement, according to project specifications.

13. Waste organic material, such as uprooted stumps, cull logs, accumulations of limbs and branches, and unmerchantable trees, would not be buried in logging road or landing fills. Dispose

of waste organic material according to project specifications, in locations designated for waste disposal. Assure compliance with the project erosion control plan.

14. Construct fills and keyways according to design drawings and specifications, not exceeding specified lift thickness and moisture content. Ensure un-compacted materials are prevented from leaving disturbance limits.

15. Stabilize all disturbed areas with mulch, erosion fabric, vegetation, rock, large organic materials, engineered structures, or other stabilization measures according to the Erosion Control Plan, and project specifications and drawings for permanent controls (that is, crib walls, gabions, riprap placement, and so forth).

16. Scatter construction-generated slash on disturbed areas to help control erosion.

a. Ensure ground contact between slash and disturbed slopes.

b. Windrow slash at the base of fill slopes to reduce sedimentation.

c. Ensure that windrows are placed along the contour and that there is ground contact between slash and disturbed slope.

17. Remove large limbs and cull logs to designated sites outside the SMZ or relocate within the SMZ to meet aquatic resource management objectives.

18. Monitor contractor's plans and operations to assure contractor does not open up more ground than can be substantially completed before expected winter shutdowns, unless erosion-control measures are implemented.

19. If snow/rainy season operations are proposed, specifications for snow/ice depth or soil operability conditions must be described. Include these specifications in the erosion control plan (see BMP 2.13- Erosion Control Plans).

20. Install erosion-control measures on incomplete roads prior to precipitation events or the start of the winter period (November 16 through March 31) and in accordance with the approved erosion control plan:

a. Remove ineffective temporary culverts, culvert plugs, diversion dams, or elevated stream crossings, leaving a channel at least as wide as before construction and as close to the original grade as possible.

b. Install temporary culverts, side drains, cross drains, diversion ditches, energy dissipaters, dips, sediment basins, berms, dikes, debris racks, pipe risers, or other facilities needed to control erosion.

c. Remove debris, obstructions, and spoil material from channels, floodplains, and riparian areas.

d. Do not leave project areas for the winter with remedial measures incomplete.

e. Plant vegetation, mulch, and amendments, or provide other protective cover for exposed soil surfaces.

21. When pioneer roads are necessary:

a. Confine construction of pioneer roads to the planned roadway limits unless otherwise specified or approved.

b. Locate and construct pioneering roads to prevent undercutting of the designated final cut slope.

c. Avoid deposition of materials outside the designated roadway limits.

d. Dewater live streams where crossed by pioneer roads with appropriate diversion devices.

e. Accommodate drainage with adequate temporary crossings.

BMP 2.4 - Road Maintenance and Operations

Objective: To ensure water-quality protection by providing adequate and appropriate maintenance and by controlling road use and operations.

Explanation: Appropriate maintenance and control of road use and operations can protect water quality, aquatic and riparian resources, and capital investments. Maintenance needs and operational controls are informed by periodic inventory and assessment that determine road condition and the potential impacts the road has on water quality.

Properly designed and maintained road surfaces and drainage systems can reduce adverse effects to water resources by facilitating natural hydrologic function. Roads and drainage systems normally deteriorate because of traffic, weather, and effects of maintenance. In addition, roads occasionally become saturated by new groundwater springs and seeps after a wildfire or unusually wet periods. Many such conditions can be corrected by timely maintenance. However, while routine maintenance may be needed to ensure the road performs as designed, it can also be a source of soil disturbance and therefore, sediment production. In particular, the grading of inside ditches and road surfaces can significantly increase sediment production rates. Less aggressive maintenance may be desired to minimize disturbance of stable sites.

Road management objectives include the level and type of maintenance that a road is expected to receive. Assigned road maintenance levels vary from 1 to 5, and are directly linked to the operational objectives for the road. Maintenance Level 1 is assigned to roads closed to all motorized vehicles for a year or more; they should be left in a stable condition, and by definition, require less maintenance. Maintenance Levels 4 and 5 are assigned to roads that are typically double-lane, aggregate-surfaced or paved, and passenger vehicle traffic is “encouraged.” They are well maintained to provide a moderate to high degree of user comfort and convenience.

Operational objectives and activities are also defined by the road management objectives, and depend upon the amount of maintenance a road is expected to receive. Road operations also include permit, contract, and agreement administration, control of seasonal use, sustaining roads in closed status and revising maintenance levels and seasonal closures, as needed. Road closures and restrictions are necessary because many forest roads are designed for dry-season use. Most local roads are not surfaced, while others have some surfacing or spot stabilization. Roads without stabilized surfaces or adequate base can be damaged by use during wet periods or by loads heavier than the road was designed to convey.

Road maintenance plans are implemented through contract, cooperators, force account, and active timber sale or other authorized activities. Contract, timber sale, and other authorized or permitted operations are bound by specifications and drawings. BMPs are incorporated as specifications, contract or sale clauses, operating plan requirements, permit clauses, and are often

shown in the drawings. The contracting officer's representative is responsible for assuring compliance by contractors; engineering representative, TSA, or FSR assures compliance by cooperator, purchaser or permitted operator. Project manager and crew supervisor assures compliance for force account work. Optimally, the forest hydrologist works with the forest quality assurance personnel to determine if approved maintenance tasks are completed with minimal resource impacts. Adjustments to future maintenance plans and methods are considered when previous methods do not provide the needed protection to water quality.

Risk from road maintenance activities can be managed by using the appropriate techniques from the following list adapted as needed to local site conditions.

Implementation

Inspection:

1. Periodically inspect system travel routes to assess condition and linkage to water quality. This information assists in setting maintenance and improvement priorities.

    a. Provide training to the engineering personnel performing condition surveys to successfully identify and assess linkage to water quality.

    b. Conduct condition surveys jointly with engineering and hydrology personnel, to more accurately assess potential of road to impact water quality.

    c. Prioritize inspections to roads at high risk of failure, followed by road segments that are hydrologically connected to the stream network, to reduce risk of diversions and cascading failures.

    d. Identify diversion potential on roads, and prioritize for treatment.

2. Inspect drainage structures and runoff patterns after major storm events and snowmelt, and perform any necessary maintenance. Major storm events include all storm events for which the National Weather Service issues a local flood watch, advisory, or warning.

    a. Determine the extent of hydrologic connectivity during and/or just after major storm events, including the connectivity of disturbed areas directly adjacent to the road network. Use this information to prioritize and plan improvements to road drainage.

    b. Immediately clean out, repair or reconstruct waterbars, inside ditches, culverts, and other features that are not functioning in order to hydrologically disconnect roads from surface waters and prevent discharges of sediment and other pollutants to water bodies.

3. Regularly inspect roads during all operations.

4. Keep roads closed to public use, but open for administrative use, in hydrologically functional condition. If waterbars are breached, forest personnel would promptly repair them.

5. Encourage field personnel of all disciplines to observe road deterioration or damage commensurate with travel to field activities, and report to engineering, for immediate action, if necessary.

a. Restrict operations if impact or imminent threat of impact to water quality is occurring.

b. Consider restricting operations if road damage such as surface displacement or active rutting is occurring.

Maintenance Planning:

1. Incorporate the forest's Wet Weather Operations Standards and notification protocols in maintenance and operations.

2. Develop and implement an erosion control plan commensurate with the complexity and scale, and duration of the activity. See BMP 2.13.

3. Develop and implement annual maintenance plans that prioritize road maintenance work for the forest or district.

a. Include roads identified as needing maintenance from field condition surveys, and roads identified through roads analysis and travel analysis that negatively impact water quality.

b. Determine method of accomplishment (contract, force account, permit, and cooperative) and define responsibilities and maintenance timing in the plan.

4. Planning for emergency interim/temporary erosion controls to protect water quality is considered for roads that may require immediate maintenance, but are beyond capability of annual maintenance plan.

5. Identify roads with potential to improve water quality by modifying road prism and drainage patterns through maintenance operations.

a. Analyze roads in an interdisciplinary manner to identify other impacts that may occur due to changes in road prism or drainage patterns. Consider local conditions and site characteristics.

b. Implement diversion potential method per Forest Service Publication 9777.1814P-SDTDC Diversion Potential at Road-Stream Crossings.

c. Consider user safety and protection of other forest resources.

d. Provide training and reference materials for forest road managers, road maintenance operators, and road maintenance contract preparation personnel to work with hydrologists in identifying appropriate roads for revised maintenance procedures.

6. Evaluate road management objectives when an inspection indicates road design is not meeting current transportation and/or resource needs. Road management objectives support forest LRMP prescriptions.

Maintenance Activities:

1. Maintain road surfaces to dissipate intercepted water in a uniform manner along the road by outsloping with rolling dips, insloping with drains, or crowning with drains. Where feasible and consistent with protecting public safety, utilize outsloping and rolling the grade (rolling dips) as the primary drainage technique.

2. Adjust surface drainage structures to minimize hydrologic connectivity by:

a. Discharging road runoff to areas of high infiltration and high surface roughness.

b. Armoring drainage facility outlet as energy dissipater and to prevent gully initiation.

c. Increasing the number drainage facilities with SMZs.

3. Clean ditches and drainage structure inlets only as often as needed to keep them functioning. Prevent unnecessary or excessive vegetation disturbance and removal on features such as swales, ditches, shoulders, and cut and fill slopes.

4. Minimize diversion potential by installing diversion prevention dips that can accommodate overtopping runoff.

a. Place diversion prevention dips downslope of crossing, rather than directly over the crossing fill, and in a location that minimizes fill loss in the event of overtopping.

b. Armor diversion prevention dips when the expected volume of fill loss is significant.

5. Address risk and consequence of future failure at the site when repairing road failures. Use vegetation, rock, and other native materials to help stabilize failure zones.

6. Maintain road surface drainage by removing berms, unless specifically designated otherwise.

7. Install and preserve markers to identify and protect drainage structures that can be damaged during maintenance activities (that is, culverts, subdrains, and so forth)

8. When grading roads or cleaning drainage structure inlets and ditches, avoid undercutting the toe of the cut slope.

9. Grade road surfaces in accordance with road management objectives and assigned maintenance level. Grade only as needed to maintain a stable running surface and adequate surface drainage.

10. Accompany grading of hydrologically connected road surfaces and inside ditches with erosion and sediment control installation.

11. Identify additional road maintenance measures to protect and maintain water; aquatic, and riparian resources including: surfacing and resurfacing, outsloping, dips and cross drains, armoring of ditches, spot rocking, replacing culverts, and installing new drainage features.

12. Effectively maintain roads in storage to eliminate all motorized vehicle use. Maintain physical closure devices, if present, to be safe and effective. For roads where physical closure methods are not feasible, install signing to inform of road closure.

13. Enforce pre-haul maintenance, maintenance during haul, and post haul maintenance (putting the road back in storage) specifications when maintenance level 1 roads are opened for use on

commercial resource management projects. Require the commercial operator to leave roads in a satisfactory condition when project is completed.

14. Opened for use on commercial resource management projects. Require the commercial operator to leave roads in a satisfactory condition when project is completed.

Operations:

1. Restrict or prohibit road use during periods when such use would likely damage the roadway surface or road drainage features are identified through Travel Analysis and Travel Management, and implement through enforcement of motor vehicle use map. Changes in road management are supported by appropriate analysis. Follow the forest's WWOS. See BMP 2.13.

2. Require users to obtain permit(s) when proposed operations involve use of roads by vehicles larger than the design vehicle, or beyond typical operation period or season of use (that is, timber purchasers, mining operations, oversize vehicle movement, and so forth. Conditions of the permitted use may require:

a. Strengthening the road surface by adding rock, dust palliatives, pavement, or armor, particularly in areas where surfaces are vulnerable to movement such as corners and steep sections.

b. Considering short term road surface stabilization by dust abatement methods, such as watering.

c. Upgrading drainage structures.

d. Restricting use to low-ground-pressure vehicles or frozen ground conditions.

e. Strengthening the road base if roads are tending to rut.

f. Using a base course of rock and/or geotextile fabric to provide subsurface stability.

g. Intensifying maintenance to handle the traffic without creating excessive erosion and damage to the road surface.

h. Repairing damage to road and forest resources associated with use by permittee.

i. Restoring the road to original standard of features, such as restoring waterbars.

3. To the extent possible, ensure drainage features are fully capable of preventing pollutant discharges to surface waters before the start of the local winter season (such as November 16 to March 31) or before the start of runoff-inducing precipitation events.

4. Permits to oversize or overweight loads require that damage by such loads be repaired by the permit holder. Damage includes impacts to water quality.

5. Cooperative maintenance agreements follow Forest Service direction for use, maintenance, repairs, and responsibilities.

6. Roads under easement are subject to terms of conditions for operation and maintenance.

BMP 2.5 - Water Source Development and Utilization

Objective: To supply water for road construction, maintenance, dust abatement, fire protection, and other management activities, while protecting and maintaining water quality.

Explanation: Water source development is needed to supply water for road construction and maintenance, dust control, and fire control. In-stream water drafting can substantially affect water flow and/or configuration of the bed, bank, or channel of streams. Aquatic species present could be at risk due to rapid changes or sustained reductions in flow, reduced dissolved oxygen, and/or increased water temperature. Exposed surfaces of water holes or other developments could erode and discharge sediment back into the waterway. In addition to direct hydrogeomorphic (forming and shaping landform by water) disruption to the channel and subsequent impacts to aquatic species, water-quality impacts can occur from road approaches that access the water drafting site. Many water drafting sites have steep approaches and in the absence of adequate drainage or surfacing, these approaches can become chronic sources of sediment and runoff to the channel. Water trucks often leak oil, and sometimes fuel, onto drafting pads, becoming a source of petroleum product contamination to surface waters.

Regular monitoring of water supply developments, during construction and use, and enforcement of contract and sale clauses, specifications, and restrictions is the responsibility of inspectors, contracting officer representatives, engineering representatives, sale administrators, and force account crew foreman.

Implementation

Location and Development:

Critical to the effectiveness of this practice is the coordination of engineering representatives, hydrologists, fishery biologists, and permit and sale administrators. Locate existing developments, or proposed streams, and evaluate for feasibility of use; determine scope and scale of environmental risks; select techniques for mitigating disturbance to water quality; and compare with the economics of development and use:

1. Water sources designed for permanent installation, such as piped diversions to off-site storage, are preferred over temporary, short term-use developments.

2. If off-site storage is not an option then the following locations would be considered.

    a. Locations where flowing side channels rather than the main thread of the channel can be used for drafting.

    b. Areas with existing pools that can be partially blocked, rather than in-channel excavation are preferred.

    c. Sites where road approaches can be hydrologically disconnected from streams.

    d. Sites where the drafting pad can be placed above the bankfull elevation of the channel with little or no excavation and/or fill placement.

3. Develop and implement Erosion Control Plan for water supply site construction and use.

4. Follow the forest's wet weather operations standards and guidelines. See BMP 2.13.

5. Excavation of streambed or bank materials for approaches, drafting pads, and water drafting intakes are subject to local or regional restrictions on ground-disturbing activities.

a. Excavations should not occur during peak runoff season.

b. Federally listed threatened and endangered species, sensitive (including State-listed) species, management Indicator species, and aquatic organisms of interest may impose further restrictions.

c. Other restrictions such as spawning season may be applicable

6. Basins will not be constructed at culvert inlets for the purpose of developing a waterhole, as these can exacerbate plugging of the culvert.

7. Access approaches are located as close to perpendicular as possible to prevent stream bank excavation.

8. Access approaches are stabilized with appropriate materials, depending on expected life and use frequency of the developed water source.

9. Fish-bearing streams that are temporarily dammed to create a drafting pool will provide fish passage for all life stages of fish.

10. Temporary dams will be removed when operations are complete.

11. Removal will be done gradually so that released impoundments do not discharge sediment into the streamflow.

12. When diverting water from streams, bypass flows will be maintained that ensure continuous surface flow in downstream reaches, and keep habitat in downstream reaches in good condition.

Drafting Operations:

1. For fish-bearing streams, the water drafting rate should not exceed 350 gallons per minute for streamflow greater than or equal to 4.0 cubic feet per second (cfs).

2. Below 4.0 cfs, drafting rates should not exceed 20 percent of surface flows.

3. Water drafting should cease when bypass surface flows drop below 1.5 cfs.

4. For non-fish-bearing streams, the water drafting rate should not exceed 350 gallons per minute for stream flow greater than or equal to 2.0 cfs.

5. Drafting rate should not exceed 50 percent of surface flow for non-fish-bearing streams.

6. Water drafting should cease from non-fish-bearing streams when bypass surface flow drops below 10 gallons per minute.

7. Intakes, for trucks and tanks, will be placed parallel to the flow of water and screened, with opening size consistent with the protection of aquatic species of interest.

8. Drafting from gravity-fed storage tanks will utilize the following

9. Water storage tanks will be fitted with properly sized pipes designed to cleanly return the tank overflow to the source stream.

10. Outflow pipes will be sized to fully contain the tank overflow and prevent it from overflowing onto the drafting pad or road surface.

11. Water storage tank return pipes at the water outfall area will be armored to prevent erosion of the streambed, bank, or channel.

12. At the end of drafting operations, intake screens will be removed and drafting pipes plugged, capped, or otherwise blocked or removed from the active channel to terminate water drafting during the winter season.

13. Trucks directly drafting from the channel will utilize the following practices.

14. Water drafting by more than one truck will not occur simultaneously

Approaches and Drafting Pads:

1. Road approaches and drafting pads will be treated to prevent sediment production and delivery to a watercourse or waterhole.

2. Road approaches will be armored as necessary from the end of the approach nearest a stream for a minimum of 50 feet, or to the nearest drainage structure (for example, waterbar or rolling dip) or point where road drainage does not drain toward the stream.

3. Areas subject to high flood events will be armored to prevent erosion and sediment delivery to water courses.

4. Where overflow runoff from water trucks or storage tanks may enter the stream, effective erosion control devices will be installed (for example, gravel berms or waterbars).

5. All water-drafting vehicles would be checked daily and will be repaired as necessary to prevent leaks of petroleum products from entering SMZs.

6. Water-drafting vehicles will contain petroleum-absorbent pads, which are placed under vehicles before drafting.

7. Water-drafting vehicles will contain petroleum spill kits. Dispose of absorbent pads according to the Hazardous Response Plan.

BMP 2.7 - Road Decommissioning

Objective: Stabilize, restore, and vegetate unneeded roads to a more natural state as necessary to protect and enhance NFS lands, resources, and water quality. The end result is that the decommissioned road would not represent a significant impact to water quality by:

1. Reducing erosion from road surfaces and slopes and related sedimentation of streams;

2. Reducing risk of mass failures and subsequent impact on water quality;

3. Restoring natural surface and subsurface drainage patterns;

4. Restoring stream channels at road crossings and where roads run adjacent to channels.

Explanation: Roads no longer needed are identified during transportation planning activities (see description of Travel Management subpart A in BMP 2.1) at the forest, watershed or project level. The unneeded road may be decommissioned, or converted to a trail or other use as appropriate. Temporary roads constructed for a specific short term purpose (for example, ski area development, minerals exploration, or vegetation extraction) are decommissioned at the completion of their intended use, and vegetation reestablished within 10 years.

Road decommissioning terminates the use of the road as a road, and as such, treatments can range from simply blocking the road entrance, to totally eliminating the road prism and structures, and restoring the land to original contours. Treatment method is carefully chosen to minimize negative impacts to water quality, reestablish vegetation, and restore ecological processes. More aggressive techniques may include greater and longer term risks to water quality through exposure of larger disrupted soil surfaces. Road decommissioning can be accomplished by using the appropriate techniques from the following list adapted as needed to local site conditions.

Implementation:

1. Engineering and hydrology personnel conduct field review of road selected for decommissioning to determine site characteristics: aspect, soil type(s), topography, surrounding vegetation, proximity to water sources, and so forth.

2. Optimize treatments that will achieve long term watershed protection goals on individual roads to stretch the available funds for road decommissioning over as many miles as practicable.

3. Weigh benefits and costs of treatments against alternative of placing road in storage and costs for continuing to maintain for hydrologic functionality. See BMP 2.1.

4. Prepare and implement an approved erosion and sediment control plan for both temporary and long term recovery of the site as specified.

5. Outslope road by pulling back unstable or perched fill. Remove berms.

6. Restore stream courses and floodplains where feasible, to natural grade and configuration.

7. Remove drainage structures determined as necessary to protect water quality:

8. Re-contour disturbed fill material, and compact minimally to allow filtration.

9. Re-contour the road surface cut and fill slopes to restore natural hillslope topography where specified.

10. De-compact areas with stable fill but reduced infiltration and productivity.

11. Haul excess fill to stable disposal areas outside of the SMZ.

12. Provide effective soil cover (such as mulch, woody debris, rock, vegetation, blankets) to exposed soil surfaces for both short- and long term recovery.

13. Revegetate disturbed areas, particularly at or near stream crossings.

14. Block vehicle access to prevent motorized traffic, in conjunction with signing, publication, and enforcement of the forest's motor vehicle use map.

BMP 2.8 - Stream Crossings

Objective: Minimize water, aquatic and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings.

Explanation: Stream crossings present the highest risk to water quality associated with roads. Forest management activities often occur in areas that require surface waters to be crossed. Depending on the activity type and duration, crossings may be needed permanently or temporarily. Permanent crossings are designed to meet applicable standards while also protecting water, aquatic, and riparian resources.

Examples of crossings include culverts, bridges, arched pipes, low water crossings, fords, vented fords, and permeable fills. Crossing materials and construction would vary, based on the type of access required and volume of use expected. Optimally, crossings should be designed and installed to provide passage for the flow of water plus anticipated sediment and debris, provide for desired aquatic organism passage, and minimize disturbance to the surface and Willow groundwater resources. Sizing is based on a weighed balance between providing for larger storm events, and cost feasibility, while still meeting other resource objectives.

Construction, reconstruction, and maintenance of a water crossing usually requires heavy equipment to be in and near streams, lakes, and other aquatic habitats to install or remove culverts, fords and bridges and their associated fills, abutments, piles, and cribbing. Such disturbance near the waterbody can increase the potential for accelerated erosion and sedimentation from destabilization of streambanks or shorelines, vegetation and ground cover removal, and soil exposure or compaction. In addition, heavy equipment has potential for contamination of the surface water from vehicle fluids.

Permits may be required for in-stream work associated with stream crossing construction and maintenance projects. There are specific requirements for such projects under the Clean Water Act and implementing regulations. State and local entities may also provide guidance and regulations.

The risk from construction, reconstruction or maintenance of stream crossings can be managed by using the appropriate techniques from the following list adapted as needed to local site conditions.

Implementation:

Enforcement of the techniques is the responsibility of the inspector and contracting officer's representative for public works contracts, the inspector and engineering representative for timber sale roads, and the permit administrator for stream crossings constructed or reconstructed under administrative operations (for example, Road Use Permit, Special Use Permit). If stream crossings are constructed, reconstructed, or maintained by force account crews, the project manager and foreman are responsible for adherence to project drawings, specifications, and

Erosion Control Plan. The forest hydrologist works in conjunction with engineering and administrative personnel to provide additional monitoring and evaluation during implementation, as needed.

Location and Design:

1. Locate roads in an interdisciplinary manner with a hydrologist, soils scientist, and geologist if necessary.

2. Plan and locate surface water crossings to limit the number and extent required to service the activity.

3. Design the stream crossing to pass the 100-year flood flow plus associated sediment and debris; armor to withstand design flows and to provide desired passage of fish and other aquatic organisms.

4. Locate and design crossings to minimize disturbance to the waterbody.

5. Use structures appropriate to the site conditions and traffic levels:

> a. Favor bridges, bottomless arches, or buried pipe-arches for those streams with identifiable floodplains and elevated road prisms, instead of pipe culverts.
>
> b. Place bridge and arch footings below the scour depth for the 100-year flood flow plus the appropriate factor of safety.
>
> c. Favor armored fords for those streams where vehicle traffic is either seasonal or temporary, or the ford design maintains the channel pattern, profile and dimension.
>
> d. For perennial streams, use vented fords, so that the crossing can pass low flows.

6. See BMP BMP 2.2: General Guidelines for the Location and Design of Roads, for further guidance.

Construction and reconstruction - permanent and temporary crossings:

1. Implement the approved erosion control plan that covers all disturbed areas, including borrow areas, stockpiles, stream diversions, etc. used during stream crossing construction or reconstruction (see BMP 2.13- Erosion Control Plan).

> a. Use temporary filters, berms, barriers, conveyances or other materials to collect sediment and prevent it from entering surface waters.
>
> b. Set the minimum construction limits needed for the project and confine disturbance to within this area.

2. Accurately establish and preserve vertical control through design invert and outlet elevations on site for each crossing, to assure that the constructed stream-crossing structure will perform as intended, and promote effective drainage without damage or impact to water, aquatic, or riparian resources.

3. Accurately establish and preserve horizontal alignment for each stream-crossing structure, to assure that flows do not erode stream banks or shoreline.

4. Install stream crossings according to project design specifications and drawings. Design should sustain bankfull dimensions of width, depth and slope, and maintain streambed and bank resiliency.

5. Minimize streambank and riparian area excavation during construction:

a. Stabilize adjacent areas disturbed during construction using surface cover (mulch), retaining structures, and or mechanical stabilization materials.

b. Keep excavated materials out of channels, floodplains, wetlands, and lakes.

c. Install silt fences or other sediment- and debris-retention barriers between the water body and construction material stockpiles and wastes.

6. Bypass roads for use during construction are considered temporary roads, and are subject to the all relevant BMPs. Decommissioning and stabilization of the bypass roads are inherent in the project plan.

7. Ensure imported fill materials meet project specifications, and are free of toxins and invasive aquatic or riparian species.

8. To the extent possible, conduct operations during the least critical periods for water and aquatic resources: when streams are dry; during low-water conditions; in compliance with spawning and breeding season restrictions.

9. Divert or dewater stream flow for all live streams or standing waterbodies during crossing installation and invasive maintenance:

a. Return clean flows to channel or water body downstream of the activity.

b. Restore flows to their natural stream course as soon as possible after construction or prior to seasonal closures.

c. Install downstream collection basins, retention facilities, or filtering systems as needed to capture and retain turbid water.

d. Remove collected sediment as needed to maintain their design capacity during the life of the project.

10. Construct diversion prevention dips to accommodate overtopping of runoff if diversion potential exists, when shown on project drawings and specifications. Locate diversion prevention dips downslope of the crossing rather than directly over crossing fill; if designed, armor diversion prevention dips based on soil characteristics and potential risk.

11. Install cross drains (for example, rolling dips; waterbars) to hydrologically disconnect the road above the crossing and to dissipate concentrated flows.

12. Remove all project debris from the water body in a manner that will cause the least disturbance.

13. Dispose of unsuitable material in approved waste areas outside of the SMZ.

14. Clean equipment used for instream work prior to entering the water body:

a. Remove external oil, grease, dirt and mud from the equipment and repair leaks prior to arriving at the project site.

b. Inspect all equipment before unloading at site.

c. Inspect equipment daily for leaks or accumulations of grease, and correct identified problems before entering streams or areas that drain directly to waterbodies.

d. Remove all dirt and plant parts to ensure that noxious weeds and aquatic invasive species are not brought to the site.

15. Fuel and service equipment used for in-stream or riparian work (including chainsaws and other hand power tools) only in designated areas (see BMP 2.10).

16. Fully suspend logs, pipes, posts and other transported materials when crossing waterbodies and SMZs.

17. Restore the original surface of the streambed, lake bottom, or wetland upon completing the crossing construction or maintenance. Construct the surface of the streambed according to project specifications and drawings for aquatic passage projects. Stockpile materials by strata or as indicated by specified design criteria when extensive dredging or excavation of these substrates is required.

18. Stabilize streambanks, shorelines, cut and fill slopes, turnouts, and other disturbed areas adjacent to the water resource following crossing installation or maintenance:

a. Use riprap or rock, wood, vegetation, and other native materials as appropriate.

b. Install riprap or other slope protection to prevent erosion from water movement.

c. Size rock slope protection for the 100-year flood flow.

d. Use appropriate construction techniques (keying in riprap) and underlayments (filter blankets or other geotextile) to prevent undermining.

e. Ensure stone used for riprap is free of weakly structured rock, soil, organic material, and other material not resistant to erosive water action.

f. Place stable materials below drainage outlets on erodible soils to dissipate energy.

19. Provide effective soil cover (mulch, woody debris, rock, vegetation, blankets) on exposed soil surfaces for both short- and long term recovery.

20. Revegetate disturbed areas.

21. Stabilize temporary crossings that must remain in place during high-runoff seasons.

22. Remove temporary crossings and restore the waterbody profile and substrate when the need for the crossing no longer exists.

Maintenance:

1. Implement the approved erosion control plan that covers all disturbed areas, including borrow areas, stockpiles, stream diversions used during stream-crossing maintenance and culvert cleaning (see BMP 2.13- Erosion Control Plan). Use temporary filters, berms,

2. Install barriers, conveyances, or other materials to collect sediment and prevent it from entering surface waters.

3. Remove all project debris from the stream or creek in a manner that would cause the least disturbance.

4. Dispose of unsuitable material in approved waste areas outside of the SMZ.

5. Clean equipment used for instream work prior to entering the stream/creek.

> a. Remove external oil, grease, dirt and mud from the equipment, and repair leaks prior to arriving at the project site.
>
> b. Inspect all equipment before unloading at site.
>
> c. Inspect equipment daily for leaks or accumulations of grease, and correct identified problems before entering streams or areas that drain directly to waterbodies.
>
> d. Remove all dirt and plant parts to ensure that noxious weeds and aquatic invasive species are not brought to the site.

6. Fuel and service equipment used for in-stream or riparian work (including chainsaws and other hand power tools) only in designated areas (see BMP 2.10).

7. Maintain and remove buildup of sediment and debris in diversion prevention dips, rolling dips, and waterbars to ensure they are functioning properly, and do not contribute to the hydrological connectivity of the road.

8. Ensure that inside ditches are maintained properly, and are relieved at regular intervals to eliminate hydrological connectivity. See BMP 2.4, Road Maintenance and Operations.

BMP 2.11 - Equipment Refueling and Servicing

Objective: Prevent fuels, lubricants, cleaners, and other harmful materials from discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources.

Explanation: Many activities require the use and maintenance of petroleum-powered equipment in the field: vegetation harvest and regeneration; road, trail, and facility construction, reconstruction, and maintenance. The activities often employ equipment that uses or contains gasoline, diesel, oil, grease, hydraulic fluids, antifreeze, coolants, cleaning agents, and/or pesticides. These petroleum and chemical products may pose a risk to surface water and groundwater during refueling and servicing the equipment.

Sale administrators, contracting officer's representatives, engineering representatives, inspectors, permit administrators, and force account crew supervisors are responsible for enforcing requirements of equipment fueling and servicing activities. They can manage the risk from fuel and chemical spills during equipment refueling or servicing by using the appropriate techniques from the following list adapted as needed to local site conditions.

Implementation:

1. Plan for appropriate equipment refueling and servicing sites during project planning and design.

2. Allow temporary refueling and servicing only at approved locations, which are well away from water or riparian resources.

3. Develop or use existing fuel and chemical management plans (for example, spill prevention control and countermeasures (SPCC), spill response plan, emergency response plan) when developing the management prescription for refueling and servicing sites.

4. Locate, design, construct, and maintain petroleum and chemical delivery and storage facilities consistent with local, State and Federal regulations.

5. Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use areas, and waste dumps to fully contain spills.

6. Use liners as needed to prevent seepage to groundwater.

7. Provide training for all personnel handling fuels and chemicals in their proper use, handling, storage, and disposal.

8. Avoid spilling fuels, lubricants, cleaners, and other chemicals during handling and transporting.

9. Prohibit excess chemicals or wastes from being stored or accumulated in the project area.

10. Remove service residues, waste oil, and other materials from NFS land and properly dispose them following completion of the project.

11. Clean up and dispose of spilled materials according to specified requirements in the appropriate guiding document.

12. Report spills and initiate appropriate clean-up action in accordance with applicable State and Federal laws, rules and regulations. The forest hazardous materials coordinator's name and phone number would be available to Forest Service personnel who administer or manage activities utilizing petroleum-powered equipment.

13. Remove contaminated soil and other material from NFS lands and dispose of this material in a manner according to controlling regulations.

14. Prepare a certified SPCC Plan for each facility, including mobile and portable facilities that have oil storage capacity of at least 1,320 gallons in containers 55 gallons or greater.

    a. Install or construct the containment features or countermeasures called for in the SPCC Plan to ensure that spilled oil does not reach groundwater or surface water.

b. Ensure that each SPCC Plan includes a spill contingency plan at each facility that is unable to provide secondary spill containment.

c. Ensure that clean-up of spills and leaking tanks complies with Federal, State and local regulations and requirements.

15. Prepare a contingency plan when quantities of petroleum products are capable of violating Basin Plan water-quality objectives.

16. Section H clauses for Public Works Construction include a standard clause for Spill Plan when project or activity includes oil or oil products storage exceeding 1,320 gallons, or a single container exceeding 660 gallons. Section H clauses also require designation of contractor's key personnel, including authorized on-site representative and phone number(s).

BMP 2.13 - Erosion Control Plan

Objective: Effectively limit and mitigate erosion and sedimentation from any ground-disturbing activities, through planning prior to commencement of project activity, and through project management and administration during project implementation.

1. Provide seamless transition between planning-level (NEPA) mitigation descriptions and on-the-ground implementation of erosion-control measures tailored to site conditions.

2. Ensure that all disturbance-related mitigation requirements and provisions for field revisions or modifications are accurately captured in one comprehensive document for each project or activity.

3. Activities include, but are not limited to: timber sale harvest; facility site, road, bridge, trail and appurtenance construction, reconstruction, and maintenance; watershed improvement; road and trail decommissioning; legacy site restoration, administratively permitted activities; and vegetation and fuels management activities.

4. Comply with overarching area plans, such as Northwest Forest Plan and Sierra Nevada Framework Plan Amendment.

Explanation: Ground-disturbing activities can result in erosion and sedimentation. By effectively planning for erosion control, sedimentation can be controlled or prevented. Engineering and hydrology personnel jointly develop mitigation recommendations and preliminary BMPs using an interdisciplinary team during the project planning process and environmental analysis phase. Erosion control plans are not be confused with design features whose primary objective is to provide or improve water quality, such as a bridge; reinforced earth retaining wall; or landscaping. The long term mitigation objectives are typically described in the NEPA document for the project, and then refined in project drawings and specifications as design features. Short term mitigation measures to prevent erosion and sedimentation are described in detail in the project's erosion control plan.

Project mitigations are conceptually described in NEPA analyses but are typically generic. Detailed mitigation measures are based on site-specific surveys, conditions, and characteristics, and are developed in the project design phase. They are ultimately displayed in the project document's design documents (specifications and drawings) based on site-specific surveys, conditions, and characteristics. Furthermore, field personnel have the responsibility to make

refinements or additional recommendations to adjust to actual current and predicted future conditions.

This flexibility is a necessary and desirable component of project implementation, but must ultimately result in implementation of requirements to protect soil and water quality. To ensure that all required and relevant mitigation measures are documented and implemented, an environmental control plan will be prepared to complement design (design addresses required mitigations specified in NEPA documents), site-specific prescriptions, and amended to include changes made in the field. Detailed and accurate environmental control plan will allow Forest Service and Water Board staff to conduct efficient, meaningful inspections of ground-disturbing projects, and will provide a needed check to ensure that mitigation measures for addressing impacts from the activities are accurately communicated to field staff.

Implementation: Ground-disturbing activities will be exempt from the requirement to prepare an erosion control plan under any of the four exemption categories below:

1. Area-based - less than 50 square feet in riparian area; less than 10,000 square feet in a non-riparian area;

2. Activity-based - activities conducted under a categorical exclusion with no wheeled or tracked equipment, or included under North Coast Regional or State waiver Category A;

3. Site-condition criteria - project locations that are: outside of riparian areas and on soils with high infiltration rates (more than 2 inches per hour) and on slopes less than 15 percent.

4. Flexibility criteria - any activity approved by the forest hydrologist with documentation explaining the rationale for the exemption.

BMP checklists would be prepared for all projects (see section 16) even if an erosion control plan is not necessary.

Erosion control plans for any ground-disturbing activity not meeting the exemption categories above will be reviewed and recommended by the forest hydrologist, and approved and signed by the District Ranger. The hydrologist’s recommendation and signature indicates that all mitigation measures prescribed in environmental documents and project plans, or resource specialist's recommendations are included on the environmental control plan. The Forest Supervisor will approve and sign the environmental control plan for forestwide ground-disturbing activities, such as annual road maintenance.

All forests will develop wet weather operations standards (WWOS). The purpose of the WWOS is to provide guidance with the end result of preventing significant adverse impacts to water quality from wet weather operations on NFTS roads and trails. Such operations may include winter hauling, fuelwood gathering, public access for hunting or Christmas tree cutting, administrative access on closed roads for springtime burning of slash piles, reforestation activities, snow plowing, or other ground disturbance outside normal operating season. WWOS must include notification protocols for informing resource specialists (hydrologists, biologists, soil scientists) as well as line officers prior to initiation or continuation of a project or activity into wet weather season.

Project field operations cannot begin until the District Ranger approves and signs the plan. The erosion control plan will be kept on site during project activity and made available for review upon request of a representative of the Water Board or any local storm water management agency which receives the storm water discharge. The erosion control plan will be amended if there is a change in control practices, site conditions, or BMPs that may result in less water-quality protection than specified in the project's environmental document, project plan, accepted erosion control plan, or permit/waiver. The amendment must include: name of person requesting the change; a description of the change, including revised BMPs or control practices to mitigate the effects of the change; and why the change is needed.

Even the best erosion and sediment control plan cannot cover the specifics of each situation that would arise on a site during the life of a project. All parties involved in the project have a role and responsibility to ensure the activity complies with the goals or intent of the erosion control plan at all times. All temporary erosion and sediment control practices must be maintained and repaired as needed to assure continued performance of their intended function.

Erosion Control Plan Contents

1. Erosion and Sediment Control will include:

    a. List of anticipated ground-disturbing actions associated with the project (for example, stream diversion; exposed cut slopes; stripped and stockpiled topsoil; water source development or use)

    b. Checklist which includes mitigation measures required by project NEPA, and in some cases CEQA documents, requirements to meet BMPs, project plans, specifications, and permits, if any. The selection of erosion and sedimentation control measures will be based on assessments of site conditions and how storm events may contribute to erosion. Control measures will be selected from the references provided in the On-Line Library at the end of section 12, or will be of equivalent effectiveness as the measures described in those reference.

    c. Illustrations of control practices designed to prevent erosion and sedimentation. Illustrations must show construction and installation details for control practices, and must be included in the erosion control plan. (for example, California Stormwater Quality Association BMP standard specifications CASQA at http://www.cabmphandbooks.com, or Caltrans Stormwater and Water Pollution Control guides at http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm)

    d. Map/drawing(s) showing soil or water buffer zones, RCAs, RCHAs, SMZs or other soil or water protection areas to be protected from project activities. Project boundary extends beyond disturbance limits.

    e. A description of the color and/or pattern of flagging or marking for soil or water buffer zones, RCAs, RCHAs, SMZs or other soil or water protection areas for each unit.

    f. Relevant sections from the forest’s WWOS that apply to activity/activities. The WWOS will provide guidance to prevent significant adverse impacts to water quality from wet weather operations on NFTS roads and trails.

i. Forest motor vehicle use map will be used to determine seasonal closures for all NFTS routes that are not under permit or for administrative use only.

(1) A storm preparedness plan that describes additional control practices to be implemented when the National Weather Service predicts a 50 percent or greater chance of precipitation.

(2) A winterization plan that describes additional control practices to be implemented to stabilize the site during periods of seasonal inactivity. The dates vary by locality, and may be determined by the individual RWQCB (for example, October 15 through May 1). “Winterized” means that the site is stabilized to prevent soil movement permanently if project activities are complete, or temporarily in a manner which would remain effective until end of the stabilization period.

(3) If winter activity, including over-snow operation is proposed, specifications for snow/ice depth or soil operability conditions must be described.

g. Control practices to reduce the tracking of sediment onto paved roads. These roads will be inspected and cleaned as necessary.

h. Control practices to reduce wind erosion and control dust.

i. A proposed sequential schedule to implement erosion and sediment control measures, in addition to the general construction schedule.

j. Location information, including directions to access the project area. Include a scaled map, with road names/numbers.

k. Contact information of project personnel, including name and cell phone number (that is, sale administrator, contracting officer’s representative, project manager, project supervisor, contractor, site superintendent, hydrologist, permit administrator and so forth)

2. Maps requirements: Maps must be clear, legible, and of a scale such that depicted features are readily discernible. For example, sale area maps may be used to satisfy the mapping requirements outlined in b.ii, below, if they meet this intent.

a. As a means of determining BMPs and erosion control measures, a topographic map should be in the project file. The map should extend beyond the boundaries of the project site, showing the project site boundaries, and surface and subsurface water bodies (ephemeral and intermittent waters, springs, wells, and wetlands) that could be at risk of water-quality impacts from project activities.

b. For timber harvest activities, unit-specific map(s) will be scaled no smaller than 1 inch equals 1,000 feet (1:12,000). For all other activities, maps will be scaled to provide legible interpretation of requirements shown above. All maps will include:

(1) Specific locations of storm water structures and controls used during project activities.

(2) Erosion hazard ratings for each unit, specified down to 20 acres if different EHRs exist within each unit.

(3) Locations of existing and proposed haul roads, watercourse crossings, skid trails, and landings.

(4) Locations of post-project storm water structures and controls.

(5) Equipment access, storage, and service areas.

3. Diversion of Live Streams: If the project involves stream diversions for crossing construction, the erosion control plan must include detailed plans for these activities, including storm contingencies. See BMP 2.8 - Stream Crossings.

4. Non-Storm Water Management: The erosion control plan will include provisions which eliminate or reduce the discharge of materials other than storm water to the storm sewer system and/or receiving waters. Such provisions will ensure that discharged materials will not have an adverse effect on receiving waters. Materials other than storm water that are discharged will be listed, along with the estimated quantity of the discharged material.

5. Waste Management and Disposal: The erosion control plan will describe waste management and disposal practices to be used at the project site. All wastes (including equipment and maintenance waste) removed from the site for disposal will be disposed of in a manner that is in compliance with Federal, State, and local laws, regulations, and ordinances. Include plan for project-specific activities that produce waste products, such as concrete truck/chute/pump washout, equipment servicing, equipment washing, and so forth.

6. Maintenance, Inspection, and Repair: The erosion control plan will include inspection, maintenance and repair procedures to ensure that all pollution-control devices identified in the erosion control plan are maintained in good and effective condition and are promptly repaired or restored. A qualified person will be assigned the responsibility to conduct inspections. The name and telephone number of that person will be listed in the erosion control plan. A tracking and follow-up procedure will be described to ensure that all inspections are done by trained personnel and that adequate response and corrective actions have been taken in response to the inspection. This procedure may be in the form of a written checklist, with inspections signed and dated. Photo documentation is encouraged.

7. Other Plans: This erosion control plan may incorporate, by reference, the appropriate elements of other plans required by local, State, or Federal agencies. A copy of any requirements incorporated by reference would be kept in the project file.

8. Post-Project Storm Water Management: The erosion control plan will describe the storm water control structures and management practices that will be implemented to minimize pollutants in storm water discharges after project activity phases have been completed at the site. It will also specify controls to be removed from the activity site(s) and methods for their removal. The discharger must consider site-specific factors and seasonal conditions when designing the control practices that will function after the project is complete.

9. Preparer: The erosion control plan will include the title and signature of the person responsible for preparation of the erosion control plan, the date of initial preparation, and the person and date responsible for any amendments to the erosion control plan.

10. Template: The Forest Service will develop sample templates for erosion control plans based on activity type. Complexity of the template will be commensurate with the degree of risk to impact water quality by the activity.

Fire Suppression and Fuels Management

Emergency fire suppression rehabilitation activities on NFS lands are conducted to reduce erosion and the loss of soil productivity, degradation of water quality, and threats to life and property both onsite, and off site. Suppression activities include fireline construction, construction of temporary access roads, back-firing operations, and aerial or ground application of short term and long term fire retardants.

Water quality objectives are weighed along with the need for rapid suppression during the development of fire attack plans. Objectives of the fire-suppression program are to preclude catastrophic watershed damage and rehabilitate suppression-related damage.

An interdisciplinary team will conduct a burned area rehabilitation survey on all fires exceeding 300 acres to assess actual fire damages. The District Ranger may request that an interdisciplinary team perform a survey for smaller fires where significant resource damage has, or could occur.

An emergency rehabilitation proposal must be submitted to the Regional Office, Ecosystem Conservation Staff for approval and funding, no later than 3 days after the fire is controlled. Rehabilitation work is accomplished both by the Forest Service force account crews and through contracts.

Fuels management activities are intended to reduce the size, cost, and damage from wildfire. Fuel biomass is altered by changing fuel type, creating fuel breaks, or by reducing or altering fuels over extensive areas.

Fuels management is also concerned with controlling dead biomass such as cull logs and slash. These materials will be rearranged, removed, or burned to reduce fuel loading.

The following BMPs are for the control of nonpoint source pollution associated with fire suppression and fuels management activities. Each BMP is based on the administrative directives that guide and direct the Forest Service permitting and administering fire suppression and fuels management activities on NFS land.

The line officer on each administrative subunit is responsible for fully implementing the directives that require water-quality protection and improvement during fire suppression and fuels management activities. The directives provide details on methods and techniques to effectively incorporate water-quality controls into each phase of the fire suppression and fuels management program.

Trained and qualified earth scientists, and other professional employees, are available to assist the fire suppression and fuels management work force identify beneficial uses and the most recent state-of-the-art water-quality control methods and techniques, and to help evaluate results.

BMP 6.2 - Consideration of Water Quality in Formulating Fire Prescriptions

Objective: To provide for water-quality protection while achieving the management objectives through the use of prescribed fire.

Explanation: Prescription elements will include, but not be limited to, such factors as fire weather, slope, aspect, soil moisture, and fuel moisture. These elements influence the fire intensity and thus have a direct effect on whether a desired ground cover remains after burning,

and whether a water-repellent layer is formed. The prescription will include at the watershed- and subwatershed-scale the optimum and maximum burn block size, aggregate burned area, acceptable disturbance for contiguous and aggregate length for the riparian/SMZ; and expected fire return intervals and maximum expected area covered by water-repellant soils.

Implementation: Field investigations will be conducted as required to identify site-specific conditions, which may affect the prescription. Both the optimum and allowable limits for the burn to ensure water-quality protection will be established prior to preparation of the burn plan. An interdisciplinary team will assess the prescription elements and the optimum and maximum acceptable disturbance, and the fire management officer or fuel management specialist will prepare the fire prescription. The fire prescription will be reviewed by the interdisciplinary team and approved by the appropriate line officer.

BMP 6.3 - Protection of Water Quality from Prescribed Burning Effects

Objective: To maintain soil productivity; minimize erosion; and minimize ash, sediment, nutrients, and debris from entering water bodies.

Explanation: Some of the techniques used to prevent water-quality degradation are:

1. Constructing water bars in fire lines,

2. Reducing fuel loading in drainage channels,

3. Maintaining the integrity of the SMZ within the limits of the burn plan,

4. Planning prescribed fires for burn intensities so that when water-repellant soils are formed, they are within the limits and at locations described in the burn plan, and

5. Retaining or re-establishing ground cover as needed to keep erosion of the burned site within the limits of the burn plan.

Implementation: Forest Service and other crews will be used to prepare the units for burning. This will include, but not be limited to, water barring firelines, reducing fuel concentrations, and moving fuel to designated disposal and burning areas.

The interdisciplinary team will identify the SMZ and soils with high risk of becoming water-repellant as part of project planning.

BMP 6.4 - Minimizing Watershed Damage from Fire-suppression Efforts

Objective: To avoid watershed damage in excess of that already caused by the wildfire.

Explanation: Avoid heavy equipment operation on fragile soils and steep slopes whenever possible.

Major project fires will utilize a Resource Advisor to assist the Incident Commander in protecting resource values during the suppression effort. National fire management policies provide in part that a wildland fire situation analysis will be prepared for all fires where containment of the fire is not expected prior to the second burning period. The analysis will be prepared by a line officer with Incident Management Team input. Watershed considerations must be part of the analysis.

Implementation: A Resource Advisor will be assigned by the Forest Supervisor and work for the Incident Management Team, specifically for the Planning Section chief. An earth scientist will be available to identify fragile soils and unstable areas, and will be assigned to the fire as a Resource Advisor.

BMP 6.5 - Repair or Stabilization of Fire-suppression-related Watershed Damage

Objective: To stabilize all areas that has had their erosion potential significantly increased, or their drainage pattern altered by suppression-related activities.

Explanation: Treatments for fire-suppression damages include, but are not limited to, installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas; seeding, planting and fertilizing to provide vegetative cover; spreading slash, or mulch to protect bare soil; repairing damaged road drainage facilities; clearing stream channels or structures and removing debris deposited by suppression activities which can have adverse life, property, and environmental impacts.

Implementation: This work will be done by the fire fighting forces either as a part of the suppression effort, or before personnel and equipment are released from the fire lines. The incident commander will be responsible, under the direction of the local line officer, for repair of suppression-related resource damage.

BMP 6.6 - Emergency Rehabilitation of Watersheds Following Wildfires

1. Objective: To minimize as far as practicable:

    a. Loss of soil and onsite productivity;

    b. Overland flow, channel obstruction, and instability; and

    c. Threats to life and property, both on-site and off-site.

Explanation: Emergency rehabilitation is a corrective measure that involves a variety of treatments.

2. Treatments may include, but are not limited to:

    a. Providing a protective soil cover, prior to the rainy season, such as seeding, mulching, or installing log erosion barriers;

    b. Installing log or straw bale check dams;

    c. Clearing hazardous debris from stream channels; and

    d. Constructing trash racks, channel-stabilization structures, and debris-retention structures.

Treatments are selected on the basis of onsite values, downstream values, probability of successful implementation, social, and environmental considerations, and cost as compared to benefits.

Implementation: Burned-area surveys will be made promptly on all burned over areas to determine if watershed emergency rehabilitation treatment is needed. Burned-area surveys of all class E (300 acres) and larger fires will be conducted by an interdisciplinary team. Team members normally include a hydrologist, a soil scientist, and representatives of other disciplines, as needed.

The burned-area survey and proposed rehabilitation treatment measures will be transmitted to the Regional Office, within 3 days of control of the fire for approval. Upon approval of the rehabilitation project, a project supervisor and restoration team will begin work with the objective of project completion before damaging storms occur. Rehabilitation projects will be evaluated following major storms and runoff events, and at least annually until the watershed is stabilized. The evaluation will determine the effectiveness of the rehabilitation measures and indicate if follow-up actions are warranted.

Stream Crossing Design Measures

Traditionally, live stream crossings for skid trails or temporary roads, were constructed by excavating the crossing, placing a culvert in the stream, and filling around the pipe with fill dirt. When the project was complete, the culvert and fill dirt were removed, usually with the bulldozer. This practice caused excessive sediment input into the stream, along with much disturbance of the stream banks. Rehabilitation work consisted of placing waterbars on each bank of the stream along with grass-seed and straw. The grass-seed/straw combo was placed from stream bank to the first waterbar ditch, on each bank, depending on slope gradient.

Cut-to-Length (CTL) machines changed the way operations were conducted in the woods. The harvester/tree processor establishes their route of travel (forwarding trails) through the unit. The harvester cuts trees down, delimbs and produces logs along these trails, all the while leaving the resulting limbs and tree tops (slash) in the trails as a “slash mat” for ground cover. The forwarder follows the harvester, driving over the “slash mat” to pick up the logs and returns to the landing. This procedure works well when abundant material is available in the stands (see figure 2 to figure 4).

The placement and removal of the log fill is accomplished with the harvester, which can grasp the processed logs with its cutting-head, feed wheels and limb knives. This allows the logs to be lifted into and out of position, much like a crane or boom. This not only reduces or eliminates the amount of soil disturbance and stream sediment loading, but the amount of the disturbed area is greatly reduced.

For perennial streams, a minimum of an 18” culvert should be used with the slash and small logs (4-8” dbh) to build the crossing. Culvert sizing should be such that a 25 year flood event could pass with no static head development upstream of the culvert. It will be best to consult the district hydrologist and roads engineer for proper watershed analysis and culvert sizing prior to construction.

Inspection of the channel before and after the construction of the crossing will need to be done by the district hydrologist to determine if any restoration is required. Any stream disturbance will have to be restored to pre-disturbance conditions. No fill material (i.e., soil) should be used in the crossing.

Figure 2. Development of a Stream Crossing Design Measure

Figure 3. Stream crossing condition after design measure is removed

Figure 4. Stream crossing condition after design measure is removed

Restoration Methodology*: Vertical Instabilities*

Vertical instabilities such as headcuts can be arrested in place and inhibited from further headward propagation into a meadow or watershed, which would mitigate further erosion, but do little to restore the water table to its previous elevation. A restoration method known as "plug-and-pond" (which plugs the channel downstream of the headcut and eventually backwaters the headcut) has been employed with great success in some meadows. Plug-and-Pond is effective at preventing erosion and restoring the ground water table in highly incised and degraded meadows; however, this method is only effective in low-gradient meadows (< 2 percent). Most of the meadows in the project area have gradients over 4 percent, and thus are not suitable candidates for plug-and-pond. As such, design structures such as rock step pools or log-and-fabric step-falls will be the most effective means by which to mitigate further erosion of a headcut.

Rock Step-Pool

Rock step-pools mimic natural channels that have gradients greater than 10% (e.g., Rosgen "A" channels), and are designed to dissipate energy by preventing water from obtaining excess velocity. This design is employed if the height of the drop (i.e., headcut) is greater than the bankfull channel depth (figure 5).

Materials would include appropriately sized rock (i.e., D84 or greater based on reference reach characteristics of nearby A or B channels), jute fabric, and local native vegetation (sod, native Willow, etc.). Traditional use of impervious geotextile material in headcut repair is not recommended because it prevents re-vegetation and stabilization of the rock and also has a tendency to channel overland and base flow behind the facing rock, further eroding the head and sidewalls of the headcut. WIN site condition data collected in the summer of 2009 showed most restoration structures utilizing this type of geotextile material had failed; the WIN sites that had successfully withstood large flood events used large rock, no geotextile fabric, and had completely re-vegetated. In lieu of non-porous geotextile material, coarse jute fabric is recommended where the substrate is non-cohesive and easily erodible. This type of jute will hold moisture; allow plants to take root and provide mulch, prevent most fines for washing away, and would eventually biodegrade. In highly cohesive clay-rich soils, no fabric is recommended; proper sizing and placement of rock and re-vegetation will be effective at preventing further erosion.

Rock step pools will require quarry rock to be transported and cached near the restoration site (unless there is sufficient loose rock *in situ*) and hauled to the site via power wheel barrow. This has the potential to cause temporary surface disturbance. Slash (from the vegetation treatments), ply wood, and/or weed cloth will be placed along ingress-egress routes to mitigate these impacts.

Figure 5. Step-pools built into two narrow headcuts at the toe of Summit Meadow, Sierra National Forest

Log-and-Fabric Step-Falls

If accessibility to a restoration site has the potential for significant ground disturbance (i.e., requires closed roads to be re-opened, or results in excessive length of rock haul routes through meadows, etc.), then materials *in situ* can be used. Since part of each restoration design will include the removal of encroaching conifers like lodgepole pine, small logs (4" - 10" dbh) will be readily available. These can be used to build a log-and-fabric step falls for headcut restoration. These structures have been found to be effective in wet meadow environments where the wood is submerged and abundant vegetation has become established to hold the lip of the headwall (figure 6). Materials will include logs cut to length (4" to 10" dbh), jute fabric, stakes, 2" fencing staples, smooth fencing wire, and native sod clumps and Willow.

Figure 6. Log-and Fabric Step-Falls used for headcut mitigation, Johnson Meadow, Sierra National Forest

Rock Arch Dam, Filter Dam, and Weir Grade-Control Structures

For knick points or grade control along a channel reach, a rock arch structure can provide a step-falls scour pool function, and when installed in series, can be used to check velocity and dissipate energy along straightened stream reaches. A filter dam is used to raise the bed of a gully by trapping suspended load, and some wash load in the interstices of the larger rock. Like rock arc and filter dams, weirs provide grade control and can be constructed of a variety of materials.

Sod Plugs

Water typically moves through meadows as sheet flow, swale flow, or channelized flow in stable E channels. Changes in peak flow from increased hydrologic connectivity in the watershed can concentrate flow in meadows, causing the incision of swales, existing natural channels, and cow trails. Elevating channel grade in incised natural channels will increase the chance of typical spring runoff reaching the floodplain (i.e., meadow) surface. This would promote localized ground water mounding and the overall elevation of the water table in the meadow. This can be achieved by filling in small (<2'x2') incised channels with native sod plugs (figure 7).

Figure 7. Photos of a native sod plug (left side: Photo A, right side: Photo B)

Photos of a native sod plug being used to increase channel grade in a slightly incised meadow stream (figure 7). Photo A is a typical plug (10"x10"x16") wrapped in jute netting, which is anchored at the riffle crest within the channel (Photo B). The plug is placed at the riffle crest to augment the riffle elevation and hence water elevation. In time, sediment will accumulate upstream of the plug thereby raising grade and lessening the degree of incision. The plug hole is filled with other native plants and mulch, which stabilizes the hole until the sod grows back in.

Vanes, Cross-Vanes and J-Hooks

In order to stabilize denuded unstable channel banks, it is often necessary to reduce the near bank shear stress to allow for vegetative recovery, in addition to other bank stabilization efforts. This is especially true for the outside of meander bends where shear stress is highest. There are many in-stream structures that provide bank protection, and the designs specified here use both rock and *in situ* wood material. Many of these restoration structures are also used in the induced meandering

method of channel restoration (described below). Vanes act as deflectors and can divert high velocity flow away from a cutbank or the outside of a meander bend. The vane functions by moving the zone of maximum velocity outward from the bank, protecting the adjacent bank and creating a point bar, but producing erosion on the opposite bank. Vanes can be constructed from a variety of materials, with post-vane design being the most adaptable to applications in a forest or near a meadow. Cross-Vanes decrease near bank shear stress and concentrate flow into the thalweg. Cross-Vanes are multifunctional in that they provide grade control, reduce bank erosion, create a stable width-to-depth ratio, maintain sediment transport capacity, and sediment competence. Like Cross-Vanes, J-Hooks serve the same purpose, but are typically employed for only one channel bank, usually on the outside of a meander bend

Appendix F – Monitoring Plan

Air Quality

As part of prescribed fire implementation, burn bosses will make observations on a regular basis of the smoke conditions that are being created by implementation. These include the travel direction and dispersion quality of smoke such as smoke settling into smoke sensitive areas and continued or potential for visibility degradation especially across main travel routes. When possible, lighting techniques and/or burn operations will be changed to minimize the continuance of these impacts.

As part of the Prescribed Fire Burn Plan, the public will be informed of planned prescribed fire implementation via local newspaper and/or in some cases personal communications. At the minimum, the news release will include planned dates, location of the burn and contact numbers for information.

Aquatic Wildlife – See Hydrology

Botany

Post project: Monitor the sensitive plant occurrences within the project area to assess their presence and condition. Monitor for three to five years to ascertain that the noxious weeds have been eradicated successfully.

Cultural Resources

Monitoring will be necessary to ensure that identified protection measures are effective (Regional PA 2013, Appendix E 1.5 and Region 5 Hazardous Fuels Protocol Appendix H) and that the selected treatment measures have had no adverse effect to cultural resources. An archaeological monitoring report will be required for each activity. Monitoring will occur during implementation of treatments within cultural resource sites. Monitoring will occur post-implementation to assess potential effects from increased access to, and visibility of, cultural resources as a result of mechanical treatments, prescribed burning operations, recreational activities and from potential unauthorized motorized use on linear cultural resource sites. Monitoring will occur within 1 year post-project implementation to assess short term effects and then at intervals of once every three years for twenty years to assess long term effects.

Fire/Fuels

Monitoring of the conditions following initial treatments will be completed to determine if additional treatments are needed to meet fire and fuels objectives. Particular attention will be given to those treatment areas associated with strategically-placed landscape area treatments (SPLATs) and defense fire protection zones (DFPZs) surrounding the identified communities, as these are the priority areas within the project for follow-up treatments to reduce surface fuels, if needed.

Geology/Soils

Monitoring of soil conditions will be conducted on a selection of activity areas to determine if soil standards and guidelines (S&Gs) and soil management objectives are being met. Ten soil transects have been established in the project area to determine existing soil conditions. Two of these soil transects will be repeated after treatment is implemented.

Monitoring will be accomplished in accordance with the National Forest Soil Disturbance Monitoring Protocol (USDA Forest Service 2009). Soil monitoring will be conducted along transects according to the protocol after the proposed treatments. Soil monitoring will be designed to determine the extent of detrimental soil compaction from mechanical treatments. Soil cover will be determined from both mechanical treatment and prescribed fire. After implementation of the selected alternative treatments (alternative 2), pre-treatment soil transects will be re-established in activity areas and post-treatment soil transects will be repeated along the same transect that were established for the pre-treatment soil transect. Timing for conducting post-treatment soil transects is important to determine soil cover after prescribed fire, especially soil cover condition going into the following winter.

Monitoring of meadows will consist of establishing photo monitoring points that will record the extent of existing conifer encroachment. Photos will be taken initially before treatment and every three years for 15 years.

Additional monitoring of the decommissioned OHV routes will determine the effectiveness of the decommissioning and closure of these routes. The routes chosen for monitoring will be the most detrimentally impacted routes discovered during conditions assessments. Monitoring will be conducted using the same protocol as the original field assessment, the GYR OHV Monitoring Protocol.

Hydrology/Water Quality

A re-survey of the 2012 Whisky Creek Stream Condition Inventory (SCI) plot (located at UTM NAD83 11N, Easting 0283253, Northing 4127781) will be done five years after project implementation to determine watershed condition. The purpose of the SCI protocol is to collect intensive and repeatable data from stream reaches to document existing stream condition and make reliable comparisons over time within or between stream reaches. SCI is designed to assess effectiveness of management actions on streams in managed watersheds (non-reference streams), as well as to document stream conditions over time in watersheds with little or no past management or that have recovered from historic management effects.

Prior to any meadow stabilization work, a Bank Erosion Hazard Index(BEHI)/Near Bank Shear Stress (NBS) evaluation will be conducted on channel banks and headcuts to quantify the existing erosion rates and sediment volumes entering the watershed. This will allow for a quantitative assessment of sediment reduction in the watershed as a result of the meadow restoration work.

Range

Establishment of an additional monitoring plot at Beehive Meadow (#504M153) including aspen regeneration monitoring will be in order to assess meadow ecological status and trend, determine the effectiveness of meadow restoration and detect changes to water (depth to water table), soil (rooting depths) and vegetation (percent of late successional plant species). The long term

rangeland condition monitoring plots located in Benedict Meadow (#504M19), Browns Meadow (#504M162) and Lower Browns Meadow (#504M164) will be re-read on a five year interval as part of the *Region 5 Long Term Rangeland Condition and Trend Monitoring Project.*

Terrestrial Wildlife

Post-project and during implementation: Monitor currently active California spotted owl and northern goshawk protected activity centers (PACs) within the project area to assess annual occupancy and breeding status. Monitor for three to five years post implementation to ascertain changes in PAC occupancy status from pre- to post-project. Monitoring of fisher and high quality fisher habitat within the project area is being conducted by the (SNAMP) fisher team.[1] The Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA Forest Service 2007a) identifies bioregional scale habitat and/or population monitoring for the Management Indicator Species for ten National Forests, including the Sierra NF. Habitat and/or distribution population monitoring for all MIS is conducted at the Sierra Nevada scale. Refer to the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a) for details by habitat and MIS.

Visual Resource

Landscape Architect will conduct field reviews and photographs from key viewing points to determine compliance with forest plan visual quality objectives (VQOs), determine if desired conditions are achieved, and identify if any new visual disturbances are present. The monitory recommendations are based on three types of monitoring specified in the Landscape Aesthetics, A Handbook for Scenery Management. Agriculture Handbook 701: implementation, effectiveness, and validation (USDA 1995):

- *Implementation monitoring* determines whether the standards and guidelines (e.g., design features, forest plan VQOs) were followed. Some agencies call it "compliance" monitoring… or said another way "Did we do what we said we would do" (USDA 1995).
- *Effectiveness monitoring* determines if application of the management plan is achieved or is headed in the right direction to achieve the desired conditions… in other words did the management practice or activity do what was intended. Did the standards and guides function as intended or were they not effective (USDA 1995).
- *Validation monitoring* determines if new information exists which alters the validity of the assumptions upon which the plan was based (USDA 1995).

[1] More information regarding SNAMP can be found on-line at http://snamp.cnr.berkeley.edu/). Status and trend monitoring for fisher and American marten was initiated in 2002 by the SNFPA Carnivore Monitoring Program. The monitoring objective is to be able to detect a 20 percent decline in population abundance and habitat (USDA Forest Service 2006).